The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Retrospect and Forecast

THE year 1921, of which we take leave to-day, will by most people be thankfully left behind. It has been a year of financial strain and commercial anxiety. Again and again it promised a return to peace and prosperity only to deceive, and it was not until the closing stage that the hope of material improvement began to be realised. As in physical illness, so in social and industrial trouble, the most irritating period is often that immediately preceding recovery, when the patient is no longer dangerously ill nor yet soundly well, but has regained sufficient energy to become thoroughly troublesome. Everyone will hope that the closing year represents that last stage in the process of recovery, and that with 1922 we are definitely entering on a return to normal conditions. In this case we think it will prove more than a pious hope. In this issue will be found many substantial reasons for believing it to be well founded.

The special articles published this week from a group of authoritative writers cover the main developments of the past year. It is interesting to find from our Patent Correspondent's review of invention that if chemical industry and manufacture have been depressed, chemical invention has been active. There has been little scope in many cases for the application of these new inventions to industry, but chemical research is the basis of progress, and the work done will be available for the advance of industry when better times arrive. In this field German activity shows no abatement, and it would be deceptive to measure ourselves against old standards when new ones are being rapidly substituted for them. In the dyestuffs industry and the manufacture of drugs, the great majority of inventions continue to come from the principal German firms engaged in the industry, although an increasing number are received from France. Germany's long lead is still maintained, but the progress of the British dyestuffs industry proves the increasing interest taken in this subject by British chemists. In this connexion our readers may be referred to the learned contribution from Dr. Maxted, who, while paying a generous tribute to the work of Claude, reminds us that the Haber process, as recently modified and improved, is capable of results far exceeding those of the original German process.

With British manufacturers there will be a feeling of real sympathy in the difficulties under which they have struggled to keep their works going. Hampered by high wages, dear coal, and other domestic conditions, they have in addition felt the full severity of the disorganised exchanges and the consequent abnormal competition from foreign rivals. As Mr. W. J. U. Woolcock, M.P., in his able review of recent legislation shows, Parliament has tried to provide some temporary protection against these adverse influences, and much as many people dislike protection in any form and under any conditions, we believe the attempt to keep faith with patriotic British firms who loyally responded to the country's call in times of great stress is approved by the bulk of the nation. What, however, we can never afford to forget is that the safeguards are temporary only, and that the only ultimate safeguard lies in efficient and economical production.

By the importing class even these temporary restrictions on freedom of trade are intensely disliked. Here, as in everything, there is, however, a sane middle course. The manufacturer who regards all merchants as mere parasites, and the merchant whose desire for cheapness obscures the claims of home industries, represent extreme and irreconcilable opposites. Between the two is a great body of reasonable opinion which recognises that both are needed by the nation and seeks to do equal justice to each. If the manufacturers have received the greater attention in the past it is due to the weight of their interests and to their excellent organisation. The traders hitherto have been unorganised and highly individualist. The two organisations in existence have been rival rather than

complementary bodies. Fortunately, there is a good prospect now of a friendly agreement between them, and this result is understood to be largely due to the good offices of two Glasgow merchants, Mr. J. C. Barr and Mr. T. Henderson.

The course of chemical trade movements in 1921 is reviewed with wide knowledge and great thoroughness by our valued contributor "W. G. W." The rapid fluctuations, month by month, are traced comprehensively and in detail. The one satisfactory feature is the conclusion that from September onwards business, though extremely quiet, has shown a steady if slow upward tendency, and that values have become much more stable; further, that the outlook is brighter than it has been for many months, and that during the next few months trade should be not only on a much better basis but considerably safer.

Turning, then, to the New Year, the signs are definitely encouraging. It would be folly to expect any boom, though we have heard one cotton magnate predicting that within six months the mills would be working overtime; the atmosphere and the actual conditions are, however, better, and the improvement promises to grow. As regards THE CHEMICAL AGE, while we appreciate beyond words the loyalty of our many friends at home and abroad, which enables this issue to be the largest yet published, we hope to achieve some modest extensions in the New Year. In the first issue of 1922 we expect to begin a series of articles on "Leaders of Chemical Industry," with an interview with Sir William Alexander, C.B. Another new feature will be a weekly Scottish Market Report supplied by Messrs. Charles Tennant & Co., of Glasgow. Dr. Stephen Miall is engaged on a series of articles on modern chemical developments, the first of which will appear next week. From other good friends who have contributed so liberally to our columns in the past contributions of equal interest and value may from time to time be expected.

Silica Gel in Sulphuric Acid Manufacture

THE preparation and possible applications of silica gel have already been referred to in these columns, and as the substance has attracted a good deal of notice it may be worth while calling attention to the suggestions for its use in connexion with sulphuric acid manufacture which Mr. Andrew M. Fairlie has recently contributed to our American contemporary *Chemical and Metallurgical Engineering*. So far technical experience with silica gel on a large scale has been limited. In fact, its only practical application in industry has been for the adsorption of gasoline vapour in oil-refining processes, but it is now suggested that there are a number of directions in which it could be employed for effecting economy in sulphuric acid processes, amongst which the following may be noted:

(1) The adsorption of sulphur dioxide from gas mixtures containing only a small percentage of that gas, followed by the recovery of the sulphur dioxide from the gel, for the purpose of producing a gas mixture strong in sulphur dioxide. By this means it is stated that a gas mixture containing, for example, ½ per cent. SO_2 can be used for producing a gas mixture containing 8 per cent. SO_2 or more. (2) The adsorption in silica gel of the SO_2 in the gas mixture of a chamber plant, after passage through only the first half of the chambers, and the recovery of the adsorbed SO_2, to make a gas mixture strong in SO_2, to reintroduce into the first chamber. It is a well-known fact that the latter half of the chambers of a chamber plant do relatively little work as compared with the first half, and by this means it is proposed to eliminate the inefficient latter half of the chamber space now employed, and cause all the oxidation and condensation to be done in the efficient first half. (3) The recovery of sulphur dioxide and nitrogen peroxide from the gas mixture escaping from the Gay-Lussac tower. Also the indirect recovery of nitric oxide from the same source, by oxidising the latter to nitrogen peroxide, with subsequent adsorption in silica gel. The extent to which nitrogen peroxide in the gas mixture escaping from the Gay-Lussac tower can be adsorbed in a practical way in silica gel is now being determined experimentally. (4) The recovery of sulphur dioxide and nitrogen peroxide from the gas mixture issuing from the last chamber of a chamber plant as a substitute for the Gay-Lussac tower, thus eliminating the latter. (5) The conversion of SO_2 to SO_3 catalytically, by passing the gas through gel previously treated with special catalysing agents, such as certain metallic salts. By means of platinised silica gel, such a conversion has been obtained experimentally.

Experiments on the catalytic efficiency of a variety of metallic salts adsorbed into the pores of silica gel have been in progress for some time. According to Mr. Fairlie, however, it is premature at present to make any definite claims for the future of metalised gel as a catalytic agent on a commercial scale.

The Purity of Calcium Carbide

WHEN accidents with chemical substances occur they may in many cases be traced to ignorance or carelessness, but, on the other hand, one frequently comes across instances in which no definite explanation of the cause of accident can be given. One such example (relating to the explosion of two magazines in which high explosives were stored together with calcium carbide) which occurred in America early in this year has been the object of a special investigation by the United States Bureau of Mines, and we feel that it is as well to emphasise the precautionary statements, in connexion with the purity of carbide, which the report issued on the matter contains. A somewhat extended search reveals no record of any accident attending the storage of carbide with explosives or of any investigation of the possible effect of carbide upon explosives, but something may be learned as to the propriety of storing them in proximity to each other from a consideration of the known properties of calcium carbide, its observed behaviour in storage, transportation and use, and reports of accidents to which it has given rise. It is well understood, of course, that calcium carbide and water react to form calcium hydroxide and acetylene, the reaction being accompanied by the evolution of heat; but it is important to bear in mind the frequently forgotten fact that the limestone from which calcium carbide is prepared often contains calcium phosphate, which is reduced in the electric furnace to calcium phosphide. The last named, when meeting with water, is followed by the evolution of gaseous hydrogen phosphide, and this gas as it comes in contact with the air becomes spon-

taneously ignited. Accordingly, when calcium carbide, containing calcium phosphide comes in contact with water, acetylene and hydrogen phosphide are evolved together, and should the phosphide be evolved in sufficient quantity to become inflamed it would ignite the acetylene.

The calcium carbide industry has, since the invention of a practical method for making this substance become of considerable commercial importance, and in the development of its manufacture it has been found that to secure the best yields and highest economic results the raw materials used must be of the highest purity. It is claimed that the manufacturers now so carefully select or purify the materials entering into the manufacture of calcium carbide that acetylene produced from it contains only a safe minimum of foreign substances. It is well, however, to bear in mind that carbide forms a most attractive means whereby to store and transport for use elsewhere the energy of remote water powers, while through conversion into cyanamide it supplies a convenient means for so "fixing" the free nitrogen of the atmosphere that it may be employed in agriculture, in chemical manufactures, and in explosives. There is, therefore, continued chance of carbide appearing from new sources of manufacture in which less pure raw materials have been used.

Although in the investigation in question the Bureau of Mines was mainly concerned in determining the cause of an accident, it has done a good service in making use of the opportunity for pointing out where there is possible room for improvement in the quality of an important everyday chemical substance.

United States Dye Inquiry

THAT the United States dye industry is not quite the perfect organisation it is sometimes represented to be is proved by the inquiry which the Senate has just authorised the Committee on the Judiciary to institute. The terms of reference look rather formidable. The Committee has to investigate "the charge that the dye industry is controlled by a combination of corporations which is in fact a monopoly and has employed agents, attorneys and lobbyists to influence Congress in behalf of special legislation to the interest of such monopoly, and to investigate the activities and methods of importers of dyes from Germany and their agents, attorneys and lobbyists to influence Congress in behalf of special legislation and to investigate the dye and chemical industries of the United States and the supply and distribution methods within the United States and elsewhere of the German dye and chemical industries with a view to recommending proper legislation."

No very decided opinions are expressed on the proposal, though some doubt is entertained as to whether any result of much value will follow. Some mild reaction seems to be taking place against exclusive tariff walls which shut out foreign trade from the United States, and in one quarter the American manufacturers are urged to placate the opponents of the dye embargo by suggesting the appointment of a board of review with an impartial chairman whose duty it shall be to decide when the embargo should be enforced.

Points from Our News Pages

A retrospect of the year 1921, noting the principal commercial, technological, and industrial developments in chemical and allied industries (pp. 818-821).

Dr. E. B. Maxted reviews the progress of the nitrogen industry during the year (pp. 821-824.).

The objects and operations of the Dyestuffs Act and the Safeguarding of Industries Act are discussed and described by Mr. W. J. U. Woolcock, C.B.E., M.P. (pp. 824-826).

A comprehensive and detailed review of chemical trade movements in 1921 is contributed by "W. G. W." (pp. 826-828).

Our Patent correspondent summarises the principal chemical inventions of the year (pp. 829-830).

Notes on the work of the principal chemical and allied societies are contributed by various correspondents (pp. 831-834).

The sources of supply, chemical properties, and possible uses of a fine clay known as Bentonite are described in a statement issued by the U.S.A. Bureau of Mines (p. 834).

The new electrolytic method of waterproofing fabrics is dealt with by a technical correspondent (p. 835).

Reports are published of meetings of the Alby United Carbide Factories, Ltd., the Sulphide Corporation, Ltd., and Minerals Separation, Ltd. (pp. 838-839).

The firmer tendency in the chemical market indicated in recent reports is still maintained (pp. 847-848).

The Calendar

JAN. 3	Hull Chemical and Engineering Society: "The Manufacture and Applications of the Chief Commercial Dye-Stuffs." F. G. Stephan. 7.30 p.m.	Wilberforce Café, Waterworks Street, Hull.
4 & 5	Physical Society and the Optical Society: Annual Exhibition. 3-6 and 7-10 p.m.	Imperial College of Science, South Kensington.
5	Society of Chemical Industry, Bristol and South Wales Section: Papers by M. Nierenstein and E. Lewis. 7.30 p.m.	Chemical Department, University, Bristol.
6	Society of Chemical Industry: Bristol and South Wales Section: "The Composition of Anthracite." A. Grounds and C. F. de la Mare. 7.30 p.m.	Swansea.
	Society of Chemical Industry, Manchester Section: "Biochemical Method." Professor A. Harden. 7 p.m.	The Textile Institute, St. Mary's Parsonage, Manchester.
12	Society of Chemical Industry: Glasgow Section: "The Teaching of Chemistry." Professor R. M. Caven. 7.15 p.m.	The Engineers' and Shipbuilders' Institute, 39, Elmbank Crescent, Glasgow.
	The Optical Society: "The Manufacture of Optical Glass." Dr. C. J. Peddle. 7.30 p.m.	The Imperial College of Science and Technology, S. Kensington, London.
	Society of Dyers and Colourists, Bradford Junior Branch: "Vat Dyes." N. Evans.	Bradford.
16	Chemical Industry Club: Paper by W. J. U. Woolcock, M.P.	2, Whitehall Court, London.
17	Hull Chemical and Engineering Society: "Modern Electricity Supply." H. Bell. 7.30 p.m.	Wilberforce Café, Waterworks Street, Hull.

1921 : A Retrospect

Developments in Chemical Science, Industry, and Commerce

THE outstanding feature of the year has been the extraordinary fall in the exchange value of the German mark. In pre-war days the mark was worth nearly a shilling in British money, and in 1921 its value fell for a time to less than a farthing. This depreciation made it easy for Germany to sell home-made goods, such as dyestuffs and many other manufactured chemicals, in foreign markets at prices so low that British manufacturers could not compete, for the German population is industrious and the wages it receives in marks appear very low when the marks are converted into British money. When, however, Germany has to purchase raw material, such as cotton, which she cannot produce in her own territory, the low value of the mark makes the purchase terribly costly, and it remains to be seen what will happen in that country when her stocks of foreign materials are exhausted. In Russia, Poland, and Austria the exchange value of the national currency has fallen to a much greater extent than in the case of Germany; while in Holland, Switzerland, and the United States of America the exchange value of the currency has been above its pre-war value in comparison with the British sovereign.

Chemical industry, in common with most other British industries, has, of course, been adversely affected by the competition of German goods sold under these conditions, and the very frequent and violent fluctuations which have occurred in the exchange values have added to the trading difficulties. The British Dyestuffs Corporation, which did well in 1920, announced in 1921 that for the half-year ending April 30 no interim dividend would be paid on the preference shares owing to the general depression in the textile and other colour-consuming trades. Many firms of high reputation failed to pay a dividend during the year or paid an abnormally low dividend, and a number temporarily got into financial difficulties owing to the sudden substantial fall in the value of goods in stock. Fresh money was commonly raised in the form of redeemable debentures or of preference shares on terms which in pre-war days would have been regarded as very onerous and much development work which had been planned was postponed. In some cases money was raised chiefly for extensions and new plant, and in others for the repayment of Bank loans which had been needed to prevent curtailment of operations.

A marked improvement in trading conditions occurred during the concluding quarter of the year. This was probably largely the result of a general reduction in wages and in the cost of coal, the reduction in the Bank rate, and the reduction in freight charges. The cost of living is falling, and there is good reason for predicting that the ensuing year will witness a return towards normal prosperity on the part of most British industrial undertakings.

Safeguarding Industries

In August the Safeguarding of Industries Act, 1921, received the Royal Assent. The object of this Act is (Part I.) to protect certain key industries for a period not exceeding five years by imposition of a duty of one-third of the value of the goods on all specified goods imported into the United Kingdom from countries not included in the British Empire, and (Part II.) to protect all British industries from competition with imported goods bought at prices below cost of production or at prices which, owing to depreciation of foreign currency, are likely seriously to affect any home industry. In the case of goods classed under Part II. a duty of one-third of the value of the goods may be imposed by order of the Board of Trade, which order may not extend for more than three years, although it may be renewed from time to time except in the case of an order made on the ground of depreciation of currency.

This Act has been cordially approved by many manufacturers who are receiving a certain measure of protection from it, and has been severely criticised by many traders who are in favour of free trade.

Coal and Benzol

A national strike of coal miners which lasted from April 1 until July 3 caused many British factories to curtail or altogether cease work. Large numbers of factory employees were in consequence thrown out of employment. During the strike fuel oils were largely used as a substitute for coal for boiler heating and a large amount of wood was also consumed. A number of locomotives fitted to consume oil under the boilers were brought into use, and petrol-consuming motors were very helpful in maintaining the transport services. Fortunately plentiful supplies of fuel oils and of petrol were available, but the community in general experienced great inconvenience and monetary loss.

When the strike ended the great rush for coal which had been anticipated did not occur. The price was too high, and neither home nor foreign buyers could afford to purchase freely. Coal accumulated at the pit-heads and many miners remained out of employment. Prices soon fell and the demand for coal increased, but the great trade depression experienced in most of the industrial centres of the world kept the demand for coal for factory use within modest limits. The high price of household coal, which was selling in London for a long period at over £3 a ton, and the reduced incomes of a large proportion of the community naturally caused a slackness in the sale of coal for domestic purposes.

For a long period most of the British coke ovens were out of action owing to the coal strike and the bad condition of the iron and steel industry. This resulted in a shortage of motor benzol and consumers had to be rationed.

The final report of the Committee on Spontaneous Combustion of Coal in Mines was issued during the year. The Committee find that spontaneous ignition in mines is not due to pyrites but to oxidation of the coal itself. Dr. Wheeler contends that the greater the proportion of oxygen contained in the coal the lower is the temperature at which the coal will ignite spontaneously.

Fuel Oil

Rapid progress has been made in the adoption of oil as a fuel in steamships. The last annual report of *Lloyd's Register of Shipping* showed that the gross tonnage of oil-fuel vessels now approaches 13,000,000 tons, and it is estimated that these ships would use about 20,000,000 tons of coal per annum if they consumed coal instead of oil. For the first time in history the total tonnage of classed vessels built for using oil as fuel exceeded the tonnage of those built to consume coal.

Fuel oil has also been substituted for coal in many boiler installations on land, but it is worthy of note that at the last general meeting of British Oil and Cake Mills, Limited, the chairman reported that, although the company's operations had not been stopped by the coal strike owing to the fact that most of the boiler plants had been converted to use oil as fuel, yet he was doubtful about the superior economy of fuel oil except in such expensive centres as London. Further north, where coal could be obtained at less than half the London price, the advantage was with coal.

Oil-Engined Ships

The propulsion of vessels fitted with internal-combustion engines fed with oil, instead of by steam generated by the combustion of fuel oil, is also becoming more common. Of the thirty-four classed oil-engined vessels built during

the year ending June 30 last all were fitted to consume a heavy oil, except three fitted with paraffin motors.

Vessels of over seven thousand tons gross tonnage now number twenty-one, so oil-engines need no longer be regarded as suitable for small vessels only.

Petroleum Supplies

The results of the search for liquid petroleum in Great Britain have been disappointing. The Hardstoft bore, in Derbyshire, has continued to yield about four barrels a day throughout the year, but all the other boreholes controlled by the Government have been abandoned with the exception of one at Darcy, near Edinburgh. This boring is being continued. The boring at Kelham, Notts, for Oilfields of England, Ltd., is reported to have reached a depth of over 2,400 ft., and should now have almost reached the oil sand which was discovered in the neighbourhood by a bore put down in 1911. English Oilfields, Ltd., which is exploiting the Norfolk oil-shale field near King's Lynn, has not yet, we understand, distilled important quantities of shale.

The discovery of petroleum in the neighbourhood of Fort Norman, Mackenzie River, Canada, which was reported last year, has not yet resulted in the winning of large supplies of petroleum, but work is proceeding. The severity of the climate during the winter months and the scarcity of borehole equipment on the spot delay progress. The supply of crude petroleum from most of the foreign oilfields continued plentiful throughout the year, and there does not appear to be any immediate danger of a shortage of fuel oil. The United States and Mexico together produced over 87 per cent. of the world's total output in 1920. In America many oil wells were closed for a time because the supply was exceeding the demand, and the price of crude oil had fallen temporarily to a figure which in some cases made production unremunerative. In October, November, and December the position improved materially.

In Persia the wells are reported to be flowing as freely as ever, and the Anglo-Persian Oil Company is starting exploration work on a new oilfield sixty miles north of Bushire. The Standard Oil Company of the United States has been offered a concession by the Persian Government to exploit some of the oilfields of northern Persia.

One of the most important oil events of the year was the development of the Mexia oilfield, in Texas. A number of new gushers, estimated to be capable collectively of yielding about a hundred thousand gallons of oil a day, have been opened up, but at present only a small proportion of this can be handled. Next year a large output of oil of medium quality may be expected from this oilfield.

Owing to the poor results obtained from the Mexican wells in which the Scottish-American Oil and Transport is interested, the fall in the value of crude oil, and the severe fall in freight charges, this company found itself in difficulties, and its assets were transferred to Tankers, Ltd., in exchange for ordinary shares in that undertaking.

Gas Manufacture

During the three months' strike of coal miners most gas undertakings completely exhausted their pre-strike stocks of coal and had to purchase German, French, Belgian, or American coal at very high prices. Some of the French coal was of extremely poor quality in spite of its high price, but very few undertakings ceased altogether to supply gas to their respective districts. Some had so to curtail the supply that gas could be used only during certain hours of the day, but the majority maintained a continuous supply of gas of more or less reduced calorific power. In many cases the supply was maintained during the concluding weeks of the strike under heavy financial loss.

During the year a committee appointed by the Board of Trade to inquire into the desirability of prescribing a limitation to the proportion of carbon monoxide in gas supplied for domestic purposes reported that it is not necessary or desirable to prescribe any such limitation, but recommended that, should the freedom from limitation be accompanied by unexpectedly unfavourable results, the attention of Parliament should be again directed to the matter.

Another Committee appointed by the Board of Trade to consider the desirability of prescribing a limitation to the proportion of incombustible constituents in town gas recommended that no limitation should be prescribed at present, but that a further inquiry should be held at the end of a period of three years.

The Fuel Research Board issued a report on "Steaming in Vertical Gas Retorts." The report supports the statements of those gas engineers who have practised steaming for some time past, and have claimed that substantial economy in gas manufacture may be effected by steaming the charge in the retort. With the vertical retorts used by the Board it was found that, without supplying additional heat to the combustion chambers, a charge of Durham coal could be steamed during carbonisation with steam to the amount of 15 per cent. of the weight of the coal, and a considerable increase in therms of gas be thereby obtained. There was, of course, a reduction in the weight of coke obtained from the charge. The proportion of steam required to yield the best results varies with the character of the coal undergoing carbonisation.

A substantial reduction in the price of gas, dating from the December meter readings, has been made in many districts, and this will be of material benefit in those factories in which town gas is used in large quantities for industrial purposes.

Nitrogen Products

A Statistical Supplement to the Final Report of the Nitrogen Products Committee of the Ministry of Munitions, compiled by Dr. Harker, was issued during the year. This shows how rapidly the output of calcium cyanamide and of synthetic ammonia has been increasing during the last few years. By-product ammonia and Chili nitrate of soda occupy, in consequence, a less prominent position in the world's nitrogen markets. Amongst the countries which manufacture nitrogen compounds by fixation processes, the British Empire is credited with less than 2 per cent. of the total productive capacity from fixation plants. The recent adoption of the Claude process by the Cumberland Coal Power and Chemicals Co., Ltd., and of a modification of the Haber process by Synthetic Ammonia and Nitrates, Ltd., may possibly appreciably alter the British position in the near future, but so long as coke manufacture and coal-gas manufacture remain important industries in this country by-product ammonia will probably remain of great importance in agriculture. The Sulphate of Ammonia Federation has been very active in stabilising the sulphate market, and the great reduction in the price of the material which has been made during the year should help to induce farmers to make more extensive use of this fertiliser.

The Oppau Explosion

A terrible explosion occurred in September at the synthetic ammonia factory at Oppau, four miles from Mannheim. Estimates of the number of casualties differ largely, but apparently at least 400 persons were killed and a larger number received injuries. It is reported that the explosion was caused by the detonation of a store of 4,500 tons of "ammonsulfat salpeter," a double salt composed of nitrate and sulphate of ammonia. This salt has been used as a fertiliser and had been regarded as free from danger of explosion. It is stated that the explosion was in no way connected with the synthetic ammonia process.

Home-Grown Sugar

A large factory for extracting sugar from beet has been erected at Kelham, Notts, and was formally opened by the Minister of Agriculture in November. The factory is owned

by Home Grown Sugar, Ltd. Unsuccessful attempts have been made previously to establish a beet sugar industry in this country, and the progress of this new venture will be watched with sympathetic interest by all concerned in the establishment of national chemical industries.

The Rubber Industry

The greater part of the year has been bad for most of the rubber plantation companies, but a marked improvement in the position occurred towards the close of the year. The supply of rubber has greatly exceeded the demand, and when the market price of rubber fell below 9d. per lb. few growers could continue operations without loss. Fortunately the price improved appreciably in the concluding months of the year. The industry must, of course, regain prosperity in time; but the great over-production must first be stopped, and a large number of growers have voluntarily restricted output. With the object of assisting the industry, the Colonial Secretary has appointed a Committee to inquire into and report upon the present rubber situation in British Colonies and Protectorates. An Institution of Rubber Industry has recently been formed to bring together rubber growers, manufacturers, and distributors. Papers dealing with the chemistry of the rubber industry are included in the subjects discussed.

Power Alcohol

The efforts to manufacture alcohol at so low a cost that it can be used as a substitute for petrol are being continued. In Burmah Sir Charles Bedford, supported financially by the Burmah Oil Co., is endeavouring to make a commercial success of alcohol production from rice-straw. In the Philippine Islands large quantities of alcohol are being produced from the nepa plant. In Java and many other places large quantities of alcohol for industrial purposes have for a long time past been produced from waste molasses. The conclusion at which most investigators appear to have arrived is that in certain localities where very large quantities of suitable waste vegetable materials are available it should be possible to produce alcohol therefrom at a cost sufficiently low to enable it to be used as a motor spirit, but that all materials which can be sold as food are too expensive for use in the production of power alcohol.

Potash and Soda Deposits

During the year plentiful supplies of potash salts from the French and German mines have been placed on the markets, and the prices of potassium compounds have, in consequence, fallen greatly since the commencement of the year.

At the annual meeting of the Magadi Soda Co., held in September last, it was stated that the company was producing a thousand tons of soda ash per week, and it was anticipated that before the close of 1921 at least 8,000 tons per month would be produced. Our readers may remember that Lake Magadi is a lake of about 30 sq. miles in area situated in British East Africa, now known as the Colony of Kenya. It consists largely of solid sesqui-carbonate of sodium of remarkable purity. The Magadi Soda Co. was formed in 1911 to market this deposit in various forms, but the war interfered with its operations. This huge natural deposit does seem destined, however, to make its influence felt in most of the soda markets of the world in the near future.

Many of the nitrate of soda deposits of Chile have remained unworked during the greater part of the year owing to the large stocks held by merchants who purchased when prices were high. It was reported in November that only thirty-four oficinas were then working in Chile.

The Chemical Societies

Most of the numerous British chemical associations continued in a flourishing condition throughout the year, but little progress has been made towards the formation of a Society representative of all chemical interests in this country. Possibly the sense of class distinction inherent in many Englishmen is an insuperable barrier. Sir William Pope, in a communication to the Society of Chemical Industry relating to the meeting in Montreal pointed out that the American Chemical Society comprises some 17,000 members, and that practically the whole of the corporate interests of chemistry in the United States is in the administration of this one Society. He further says that this concentration of interests into one organisation has given the Society political influence. We have nothing of the kind in this country, although the intimate and cordial co-operation of the Chemical Society with the Society of Chemical Industry which is now in evidence is a move in the right direction. The latter Society now has sections active in New York, Montreal, Ottawa, Shawinigan, Toronto, and Australia, in addition to its British sections.

Amalgamation between the British Association of Chemists and the National Association of Industrial Chemists has been considered during the year, but the suggestion has been rejected, although the associations remain friendly. The Society of Public Analysts has continued its placid existence, and continues to issue that admirable little journal *The Analyst*, which is invaluable to all engaged in food analysis. The Society still retains its cumbrous title, "The Society of Public Analysts and other Analytical Chemists," although the shorter title, "Society of Analysts," has been suggested. The Institute of Chemistry has been continuing its examining operations on its accustomed lines, and has recently consented to co-operate with the Board of Trade in arrangements for the award of certificates to students in technical schools and colleges. In a Pharmacy Acts Amendment Bill introduced into Parliament by Captain O'Grady it is proposed that the Institute shall be represented on a Council to be formed to regularise the position of persons trading as chemists, but the Institute has repudiated all association with the Bill.

The Association of British Chemical Manufacturers held its annual meeting in London, and has been active in connexion with the Dyestuffs Act, railway transport, smoke abatement, chemical research, and co-operation amongst manufacturers. It is stated that this Association represents capital of about a hundred million pounds. Although numerically small, the Association is politically influential.

The Chemical Industry Club numbers about seven hundred members, and is doing useful work for those chemists who can take advantage of the opportunity this club affords of enjoying club life in a chemical atmosphere. More candidates for membership are wanted in order yet further to increase the stability, influence, and advantages of the club.

Meetings of chemists interested in chemical engineering were held towards the close of the year with the object of forming an Institution of Chemical Engineers. Professor Hinchley, in supporting the proposition to form the Institution, intimated that it would not interfere with the work of the Chemical Engineering Group of the Society of Chemical Industry.

The Second International Conference of Pure and Applied Chemistry was held in Brussels in June. Among other things, it was agreed to establish international laboratories for investigation of refractory materials, such laboratories to form sections of the fuel laboratories. A resolution was also passed that international patents should be established and that a conference should be called to consider the matter.

In addition to the associations already mentioned, a number of small local chemical associations continue to meet in various parts of the Kingdom.

Gifts

Generous gifts continue to be given to training colleges by wealthy individuals who appreciate the advantage to humanity of progress in scientific knowledge. During the

year Mr. H. H. Wills presented £200,000 to Bristol University to build and equip a new physics laboratory. Mr. W. J. Chrystal bequeathed £10,000 to the University of Glasgow and £10,000 to the Royal Technical College of Glasgow. Sir E. A. Brotherton gave £20,000 to the University of Leeds for developing study and research in bacteriology. Sir Garrod Thomas promised to give the University of Wales farm property of the estimated value of £8,000, the income to be devoted to encourage post-graduate work in chemistry and physics. Messrs. Bertrams, Ltd., of Edinburgh, presented to the Heriot-Watt College a working model paper-making plant comprising digester, beater, and paper-making machine. It is to be used in the teaching of the chemistry of paper-making.

During the last few years very large sums have been presented to training and research institutions by individual manufacturers and by commercial corporations. It is to be hoped that where possible these men or corporations will continue their good work by remaining in association with the colleges they have endowed, and by giving the colleges that practical business guidance which is needed even for the maintenance of a purely academical institution. The habitual association of men of science with men of industry must assuredly result in rapid progress in the acquirement of knowledge and in the application of that knowledge to industrial life.

Obituary

The list of those associated with chemical science who have passed away during the year includes the following well-known names: J. R. Appleyard, S. H. Blichfeldt, Bertram Blount, A. Winter Blyth, David Brown, J. C. Cain, Sir Charles Cameron, W. J. Chrystal, F. P. Dewey, Charles Estcourt, John R. Griffin, Sir Lazarus Fletcher, John Hughes, J. W. Leitch, F. R. Mallet, L. C. Miall, E. J. Mills, Ambrose Monel, Lord Moulton, William Odling, H. R. A. Oertling, F. W. Passmore, W. H. Pike, Charles Simmonds, John Spiller, and H. R. Le Sueur.

Review of the Nitrogen Industry in 1921

By E. B. Maxted, Ph.D., B.Sc.

In spite of the prevalent commercial depression in this and other industries, considerable advances have been made during the present year, particularly in connexion with the technology and development of nitrogen fixation. Thus, in addition to the work carried out in this country by Synthetic Ammonia and Nitrates, Ltd., much progress has been made by Claude in the use of abnormally high pressures for the direct synthesis of ammonia, and an increasingly important factor in the same field is to be found in the developments which are at present taking place at the works of the Solvay Co. at Syracuse, N.Y.

The catastrophic explosion at Oppau and the consequent temporary suspension of much of the German capacity for producing fixed nitrogen, an occurrence which might have been expected to exert an important influence on the international position, have been somewhat minimised in economic effect by the present condition of the fixed nitrogen market and by the fact that the ammonia-producing plant itself is stated to have suffered less damage than other portions of the factory. In connexion with the position of Germany as a producer of fixed nitrogen, the supplementary report of the Nitrogen Products Committee[1] is of interest. Tabulated statistics are given of the world's production of fixed nitrogen in its various forms, including Chile nitrate, by-product and synthetic ammonia, cyanamide, and calcium nitrate from arc processes. A factor to be noted is the enormous increase in the agricultural demand for nitrogenous fertilisers that has occurred during recent years, the consumption in this country being 58,000 tons in 1919, compared with 19,000 tons in 1916. Similar and even larger increases in the demand in other countries give support to the view that, provided a nitrogenous fertiliser can be produced at a sufficiently low figure, there should be a ready and increasing market for far larger quantities still.

In the course of the above-mentioned report, it is stated that in Great Britain Synthetic Ammonia and Nitrates, Ltd., are at present concentrating on a plant capable of producing 6,000 to 7,000 tons of fixed nitrogen annually—corresponding with 24,000 to 28,000 tons of ammonium sulphate—with facilities for an eventual increase to about ten times this capacity. In addition to the above very substantial step towards the breaking of the present German monopoly in fixed nitrogen, the efforts of Claude to operate the synthesis at higher pressures show considerable promise. The barium cyanide process has once more become the subject of large-scale experiments, this time at the works of the British Cyanides Co. in Birmingham. In view of the highly corrosive action of alkaline and alkaline earth cyanides at high temperatures, the problem is to a large extent one of furnace construction. A similar remark applies also to the Bucher process for the synthesis of alkaline cyanides, which is reported to have been given up in the United States, at any rate for the time being, on account of the rapid deterioration of the retorts.

Among the original papers and other publications which have appeared during the past year, the following may be noticed:—

Synthesis of Ammonia

Further details of the Claude ammonia plant have been given by Claude at the first annual meeting of the Société de Chimie Industrielle, held in Paris on October 10, 1921, and by J. H. West at a joint meeting of the Chemical Engineering Group of the Society of Chemical Industry and the Institution of Mechanical Engineers on November 22. The nitrogen and hydrogen required for the synthesis are prepared separately by low temperature processes from air and from coke-oven gas respectively. An interesting point in connexion with the manufacture of the hydrogen is to be found in the use of liquid nitrogen as a lubricant in the expansion engine. The gases taken for the synthesis are compressed to a pressure of about 1,000 atmospheres and, after passage through the usual preliminary catalyst tube for the removal of any traces of oxygen and carbon monoxide by conversion to water and methane, pass through a series of heat exchangers and catalyst tubes with intermediate condensers for the separation of ammonia. The high pressure employed facilitates an autothermic operation without the use of complicated heat exchangers, by reason of the favourable position of the ammonia equilibrium point, and the content of ammonia in the reaction gases is sufficient to render possible a separation by liquefaction at the ordinary temperature.

Tribute must be paid to the mechanical genius of Claude in rendering possible the use of pressures of the magnitude employed. The many advantages which accrue from the employment of as high a pressure as is compatible with ease of working have, of course, been realised from the beginning by each investigator in this field, and Claude's success in extending the hitherto accepted limit of about 200 atmospheres for commercial working to one of 1,000 atmospheres or more, must be regarded as one of the engineering triumphs of the present decade. A large-scale experimental Claude plant has been in operation in France for some time, and industrial developments in this country will be awaited with interest. While much of the published information with respect to the plant appears to be written principally as propaganda for the process, rather than from an impartial standpoint, yet, all the same, Claude's scientific standing and the well-established

[1] *The Chem. Age*, Vol. V., pp. 145, 148.

success of, for instance, his low-temperature air separation plants may well inspire a reasonable confidence in the successful use of these high pressures even under works conditions. In fairness to the interests of other synthetic ammonia developments in this country, it should, however, be emphasised, as was pointed out by Dr. Harker in the course of the discussion on Mr. West's paper, that modern yields, even at lower pressures, exceed enormously the figures published by Haber and others, and that data so obtained afford little or no guide to the results subsequently attained in the course of development.

Catalysts

A large number of patent specifications dealing with preparation of suitable catalysts are now available. An example of the use of a promoter in a form chemically combined with the primary catalyst is to be found in a patent application of the Norsk Hydro-Elektrisk Kvaelstofaktieselskab[1], in which compound alkaline iron cyanides are heated to a temperature below 500°C. in a neutral atmosphere, the product, after reduction by hydrogen, being stated to be active below 400°C. In a later patent[2] the same firm claims the use of mixtures of iron, cobalt, chromium or manganese with an alkaline or alkaline earth cyanide. A suitable working temperature is stated to be 375°C. J. C. Clancy[3] impregnates purified pumice or a similar support with a concentrated solution of calcium ferro-cyanide. The mass is dried at 100°C. and reduced in hydrogen at a gradually increasing temperature. The working temperature for the use of this catalyst for the synthesis of ammonia is 450°C. In connexion with these and similar claims for relatively low temperatures, it should be borne in mind that, under working conditions, the rate of production of ammonia depends not only on the position of the equilibrium point but also on the actual velocity constant for the temperature employed, and, while many catalysts will, provided that sufficient time is allowed, form the relatively large percentage of ammonia corresponding to the equilibrium, even at temperatures below 400°C., yet the reaction velocity is usually found to be too low under such conditions to justify commercial employment.

The Nitro-Fixation Syndicate, Ltd., and Jenkins[4] have described a process for the production of iron possessing the high degree of freedom from inhibitive substances which is necessary for efficient working. According to the procedure in question, a solution of ferric nitrate is freed from compounds of phosphorus and arsenic by fractional precipitation with ammonia, followed by the addition of silver nitrate to precipitate all chloride. The solution is next evaporated to dryness and calcined in such a way that only part of the iron nitrate is transformed into oxide. On washing the product with water, any sulphate is stated to be removed together with undecomposed nitrate. The iron oxide, thus produced, is reduced with hydrogen or ammonia at 500°C. As a promoter, ammonium molybdate, titanium nitrate or other bodies may be added to the purified iron oxide before reduction. Claude[5] employs the fusion method of purification. The iron, after a preliminary fusion in the presence of oxygen, is mixed with from 5 to 10 per cent. of alkaline oxides or hydroxides and a small quantity of calcium oxide. The mixture is placed in a magnesia crucible and once more fused in oxygen.

Duparc and Urfer[6] claim the use of a catalyst made by reducing an oxide of lithium, uranium, calcium, barium, strontium, titanium, beryllium, molybdenum or vanadium, by means of aluminium or magnesium. The resulting product is stated to be active even at 250°C., but the speed of the induced reaction at this temperature is not mentioned.

[1] Brit. Pat. 153290. *The Chem. Age*, Vol. IV., p. 106.
[2] Brit. Pat. 159869. *The Chem. Age*, Vol. IV., p. 567.
[3] U.S. Pat. 1363392.
[4] Brit. Pat. 159960. *The Chem. Age*, Vol. IV., p. 455.
[5] Brit. Pat. 153254. *The Chem. Age*, Vol. IV., p. 105.
[6] Brit. Pat. 140061.

Turning to proposals in connexion with plant, Claude[1] suggests the replacement of a liquid non-volatile heating bath, such as nitre, which was used by Haber for some of his earlier experiments, by a liquid, the boiling point of which approximates to the temperature necessary for the synthesis. On immersing the catalyst tube in a bath of this nature, the temperature of reaction can be definitely fixed by the boiling point of the liquid. As a suitable body for this purpose, sulphur containing a small quantity of phosphorus pentasulphide is suggested. In another patent[2] the use of a liquid heating bath placed between a thin-walled reaction chamber and a stout pressure-resisting shell is proposed.

A somewhat novel method of preparing a mixture of nitrogen and hydrogen for the synthesis of ammonia has been described by the Nitrogen Corporation.[3] Gas oil is cracked in the presence of air and steam in such a way as to give a mixture of nitrogen, hydrogen, carbon monoxide, carbon dioxide and steam. The carbon monoxide is partially transformed to dioxide by passing the mixed gases over heated ferric oxide, and the conversion is completed by preferential combustion in the presence of a catalyst made by heating together, for instance, copper cyanamide and bismuth ferrocyanide. The carbon dioxide is absorbed by means of ammonia solution and the residual gases consist of nitrogen and hydrogen. The substitution of ammonia for the more usual water-scrubber for the removal of carbon dioxide is to be noted, since it obviously affords a means of fixing as carbonate part of the ammonia produced by the synthesis, and the solution of ammonium carbonate thus obtained may subsequently be transformed into ammonium sulphate by double decomposition, for instance, with calcium sulphate. According to the specification, it is proposed to effect this conversion by passing in sulphur dioxide, by which means ammonium sulphite is produced. This is subsequently oxidised to sulphate by bubbling air through the solution in the presence of vanadium pentoxide as a catalyst.

The Oppau Explosion

A *résumé* of the progress of the nitrogen industry during the past year would be incomplete without some note of the explosion which destroyed the Oppau Synthetic Ammonia Works on September 21.[4] While the total death-roll proved eventually to be far less than was originally feared, this explosion nevertheless represents probably the most serious and overwhelming accident that has ever overtaken a chemical works. Whatever may have been the source of the initial explosion, the remarkable feature lies in the fact that a store of some 4,500 tons of mixed ammonium salts also exploded. In recent years, much work had been done by the Badische Co. on the production of so-called "Kaliammonsalpeter" by interaction of potassium chloride and ammonium nitrate, also of "Ammonsulfatsalpeter," a double salt of ammonium nitrate and ammonium sulphate. Such salts were regarded as non-explosive, and it was even the practice to break up the dumps by blasting. Whether or not the disaster originated in the dumps themselves or, on the other hand, was originated by an external detonation, for instance by an explosion of hydrogen on a large scale, cannot now be determined. It seems certain that, in the absence of secondary changes in the dumps themselves, explosion could not have been induced by a detonation of ordinary magnitude, but little or nothing is known of the effect of a relatively large, as well as violent, preliminary explosion on the stability of the ammonium salts in question. Certainly two separate shocks were felt at some distance from the explosion, but these may well have had their source in the unequal velocity of propagation of the explosion wave through the earth and the air respectively. In any case, the disaster must have far-reaching effects on our views concerning the storage of mixed salts containing

[1] Brit. Pat. 155302. *The Chem. Age*, Vol. IV., p. 230.
[2] Brit. Pat. 140083.
[3] Brit. Pats. 163046/7. *The Chem. Age*, Vol. V., p. 76.
[4] *The Chem. Age*, Vol. V., pp. 370, 391. *J. Soc. Chem. Ind.*, 1921, 40, 381 R.

ammonium nitrate. A further example of the spontaneous explosion of two truck-loads of ammonium nitrate, which also came from Oppau, is given in a letter to THE CHEMICAL AGE.[1] On being unloaded, these trucks suddenly exploded, killing ten men. The whole question of the stability of ammonium nitrate, and more especially of the catalytic or other influence of possible impurities, deserves, in the interests of all concerned, the very fullest re-investigation. It has also been suggested that, under certain conditions, chlorine might be liberated from the mixture of potassium chloride and ammonium nitrate, and that this might react with ammonia with production of nitrogen chloride. In any case, it would seem that, for the sake of safety, nitrogen fixation works should restrict themselves to the production of the danger-free sulphate or chloride rather than nitrate, except where this last is required for the manufacture of explosives.

Other Methods of Nitrogen Fixation

In the production of ammonia by means of cyanamide but little fresh progress appears to have been made during the past year. The process nevertheless shows no sign of yielding its place as the principal alternative to the direct synthesis of ammonia. The Nitrogen Products Co.'s plant at Dagenham is stated[2] to be closed, possibly in view of the fact that this was more especially for the manufacture of nitric acid from cyanamide.

In the production of cyanides by the Bucher or similar processes serious difficulties appear, as already mentioned, to lie in the rapid corrosion of the retorts and, for this reason, progress in the mechanical and structural design of the converters is of primary importance if the process is to be worked successfully on a commercial scale. Proposals for the design of converters for the process in question are contained in British Patents 156478[3] and 156479,[4] also in U.S. Patent 1379187. Hara[5] has carried out work on the optimum conditions for the reaction. Carbon, either as wood charcoal or lampblack, led to the production of far greater yields of cyanide than were obtained with coke, and iron in a precipitated form was found to possess a catalytic activity about ten times as great as that of mechanically divided iron. The same author, in British Patent 146819, claims a process employing as a catalyst chemically-produced finely divided iron, which has been disseminated through the carbon by treating this with a solution of an iron salt.

The manufacture of aluminium nitride appears to be receiving fresh attention. According to a process worked out by W. Hoopes,[6] the reaction mixture, which conducts electricity easily when hot, but offers a relatively high resistance when cold, is placed as a pervious mass between suitable electrodes and subjected to preliminary heating by means of a fuel gas before the passage of the current. The great advantage of aluminium nitride over alkaline and alkaline earth cyanides is, of course, to be found in its non-corrosive nature even at high temperatures. In connexion with other nitrides, it is interesting to note that Noyes and Smith[7] have calculated the dissociation pressure of iron nitride at 460°C., which is the optimum temperature for its formation from iron and ammonia, and have found this to be in any case far too high to offer any hope of a direct synthesis from iron and nitrogen.

The arc process of nitrogen fixation is represented by a patent[8] granted to J. S. Island, in which an arc, struck across an annular space in an apparatus of special design, is blown out into a double surfaced flame by the injected air. A further type of electrode, stated to increase the efficiency of the arc for the oxidation of nitrogen, is described in British Patent 159709.[1]

Ammonium Salts

Certain of the year's publications relating to the production of ammonium salts have already been dealt with in connexion with the synthesis of ammonia. Several patents concerning the production of ammonium chloride from the mother liquors of the Solvay ammonia soda process are of interest. Thus, the Deutsche Solvay Werke[2] state that it is advantageous for the preparation of the pure chloride to add sufficient ammonia solution to convert all the ammonium hydrogen carbonate to normal carbonate, the concentrated liquor being subsequently cooled for the separation of ammonium chloride. An alternative method for crystallising out ammonium chloride in a state of purity is contained in British Patent 164001.[3] The residual liquor from the ammonia soda process, containing ammonium chloride, ammonium carbonate and sodium chloride, is heated to expel carbon dioxide, and a solid mixture of ammonium carbonate and bicarbonate is collected. The solution is then concentrated and cooled to 25°C., when ammonium chloride separates out. The thermal effects in the various stages of the ammonia soda process have been tabulated by Voss[4] and compared with the actual expenditure of energy required in practice.

An important paper dealing with the formation of ammonium sulphate by the interaction of ammonium carbonate and calcium sulphate has been published by Neumann and Gellendien.[5] While, from considerations based on the solubility of the various components of the system, the yield of ammonium sulphate should be practically quantitative, for instance, at 18°C., employing N/4 ammonium sulphate solution, maximum yields varying from 85-92 per cent., according to the form in which the calcium sulphate is employed, were obtained. In practice the use of natural anhydrite or of gypsum ignited at 200-300°C. is recommended.

The manufacture of neutral ammonium sulphate in gas works practice has been described by J. B. Hansford.[6] For details the original paper should be consulted. According to the Wilton process for the same purpose[7] crude ammonium sulphate is sprayed with its mother liquor containing ammonia in solution, by which means the solution of the sulphate which is being washed is avoided. The South Metropolitan Gas Co. and P. Parrish[8] have patented an interesting method of avoiding the absorption of cyanogen compounds by ammonium sulphate during its preparation from impure ammoniacal gases. It is found that on adding ammonium polysulphide either to the ammonia still, or alternatively by interposing a polysulphide solution in the part of the ammoniacal gas, the cyanogen compounds are retained by this. The whole question of the distillation of ammoniacal liquor for the manufacture of ammonia has been treated by W. Wyld in an interesting article.[9] The author emphasises the desirability of a preliminary removal of carbon dioxide, particularly by reason of the formation of incrustations of calcium carbonate during the distillation. The design and working of ammonia stills are also discussed.

Nitric Acid and Nitrates

The influence of various factors on the yield of nitric acid from sodium nitrate by the pot process has been discussed at length by Webb.[10] In particular, the influence of the concentration and proportion of sulphuric acid used on the yield of nitric acid, and on the proportion of nitrous acid

[1] *The Chem. Age*, Vol. V., p. 426.
[2] *The Chem. Age*, Vol. V., p. 151.
[3] *The Chem. Age*, Vol. IV., p. 342.
[4] *The Chem. Age*, Vol. IV., p. 376.
[5] "Tech. Rep. Tohoku Imp. Univ.," 1921, 2 (L). Ex. *J. Soc. Chem. Ind.*, 1921, 40, 542 A.
[6] U.S. Pat. 1393370/1/2.
[7] *J. Am. Chem. Soc.*, 1921, 43, *p.* 475.
[8] Brit. Pat. 154356. *The Chem. Age*, Vol. IV., p. 20.

[1] *The Chem. Age*, Vol. IV., p. 420.
[2] German Pat. 335532. *J. Soc. Chem. Ind.*, 1921, 40, 508 A.
[3] *The Chem. Age*, Vol. V., p. 138.
[4] *Chem. Zig.*, 1921, 45, pp. 940, 968.
[5] *Z. angew. Chem.*, 1921, 34, p. 441.
[6] *Gas World*, 1921, 75, p. 243.
[7] *The Chem. Age*, Vol. V., p. 377.
[8] Brit. Pat. 170613. *The Chem. Age*, Vol. V., p. 108.
[9] *The Chem. Age*, Vol. IV., p. 358.
[10] *J. Soc. Chem. Ind.*, 1921, 40, p. 212 T.

contained in the distillate, was investigated. In some cases the experiments were carried out on a large scale with many tons of nitre, and the results are worthy of careful study. Partington[1] has described the ammonia oxidation plant employed at Höchst. A platinum gauze catalyst of conventional type is used, and both the ammonia and air are carefully filtered before reaction. The catalyst is heated initially by means of a hydrogen or coal-gas flame, and maintains its temperature subsequently by reason of the heat of reaction. The efficiency is stated to be just under 90 per cent. An interesting observation has been made by Decarrière[2] with respect to the action of free hydrogen in the oxidation of ammonia. Small amounts—*i.e.*, 0.4 per cent. by volume in the reaction mixture—slightly increase the yield of nitric acid, while larger amounts depress this.

Several patent specifications dealing with the absorption or separation of nitrous vapours, either from an ammonia oxidation plant or from the arc process, have appeared during the course of the year. Thus, Toniolo[1] has protected a process for the preparation of liquid oxides of nitrogen in which the nitrous gases from an ammonia oxidation plant are dehydrated partly by treatment with nitric acid and partly by being sprayed with liquid oxides of nitrogen, the gases being subsequently subjected to a process of refrigeration. Galle[2] describes the concentration of nitric acid by means of a Pauling tower. Without the use of sulphuric acid, nitric acid up to a concentration of about 65 per cent. can, as is well known, be obtained, but beyond this point about two parts of sulphuric acid are required for every part of water contained in the nitric acid.

[1] *J. Soc. Chem. Ind.*, 1921, 40, p. 185 R.
[2] *C. Rend*, 1921, 172, p. 1663.

[1] Brit. Pat. 164734. *The Chem. Age*, Vol. V., p. 193.
[2] *Z. f. angew. Chem.*, 1921, 34, pp. 108, 173.

Chemical Industry and Legislation in 1921

By W. J. U. Woolcock, C.B.E., M.P.

THE year under review is noteworthy for the attempt made by Parliament to safeguard the sections of Chemical Industry which, always of tender growth in this country, were found to be essential in time of war. Dyestuffs and fine chemicals were recognised as important articles not entirely for their intrinsic worth but because their production led to the training and employment of scientific brains. Unfortunately the two groups of chemicals were not dealt with in the same Bill. The Dyestuffs Act, which dealt with synthetic organic dyes and their intermediates, came into force in the early days of the year; the Safeguarding of Industries Act in the early autumn. The single advantage of having these two groups in different Acts is the academic interest which may be taken in a comparative study of the relative advantages and disadvantages of safeguarding by licence or by tariff.

The Dyestuffs Act

The Dyestuffs Act prohibits the importation into this country of all synthetic organic dyestuffs and their intermediates, and having done so provides two pieces of machinery for working it:

(1) The Licensing Committee, which recommends the Board of Trade to issue or refuse to issue licences for the importation of such dyestuffs and their intermediates, and

(2) The Development Committee, which is concerned with the efficient and economic development of the Dyestuffs Industry.

The work of these two committees is closely interlocked, for the statistics which the Licensing Committee alone can supply must be the basis on which the Development Committee must build. For this reason five members of the Licensing Committee are also members of the Development Committee, and for the same reason the Development Committee could only start its work at a later period than the Licensing Committee.

Work of the Licensing Committee

The Licensing Committee has held thirty formal meetings, in addition to sub-committee meetings, and very protracted some of them have been. It has dealt with over three thousand applications for licences many of which covered several individual dyes. The value in sterling of the goods for which licences have been applied up to the end of October is round about one million pounds, of which about three-quarters of a million pounds' worth has been granted and a quarter of a million pounds' worth refused. This has entailed an enormous amount of work which has proceeded with somewhat unexpected smoothness for three reasons. The first is that immediately prior to the passing of the Act very large quantities of foreign dyes were rushed into the country and big stocks were accumulated. The second is that the slump in trade, which affected the textile industry no less than any other industry, stopped the demand for dyes. The third is the composition of the committee. It consists of five persons representing users of dyes, three persons representing makers of dyes, and three who are called in the official language of the Act (and be it whispered also sometimes in jest) "other persons," one of whom is the chairman. The committee, therefore, consists of eight persons with more or less expert knowledge, interested, five on one side and three on the other, in the purchase or manufacture of dyes, and three independent members. If the eight interested members were to regard themselves as delegates of their respective interests, five to urge and three to oppose the granting of every licence applied for, the work of the committee would become unbearably tedious. Fortunately, the prevailing desire in everyone's mind has been to hear the evidence and give a fair decision. Sometimes the evidence has been scanty; at others, misleading. Wrong decisions have been given, but the extraordinary thing is how seldom this has happened considering the amount of work the committee has had to do and how unfamiliar we are with this type of work in this country. The work of the committee has been watched with the most faithful exactitude and you may search the pages of this journal for a long time to collect over the whole period under review half a dozen real cases of hardship incurred by reason of the work of the committee. The inevitable, although unconscious, bias which must exist in the minds of the representatives of the various trades is invariably counteracted by the unbiased view of the independent members of the committee.

There are two main grounds on which an application for a licence to import a dyestuff may be based:

(1) That an equivalent British dyestuff is unobtainable in this country.

(2) That it is only obtainable in this country at a price which is so much greater than that of the foreign dyestuff that it places the user in an unduly disadvantageous competitive position.

In the first case the onus of proof, that the British dyestuff is equivalent to the foreign, is on the maker. In the latter case, the onus of proof that he is placed in an unduly disadvantageous position, is on the user desiring to import.

When the applicant for a licence is a *bona fide* user, and clearly states the grounds on which he applies in his first communication to the committee and gives all the information which his representative association—the Colour Users' Association—recommends him to give, there is very little delay in dealing with his application.

The method of procedure is as follows: The applicant for a licence furnishes the committee with a description of the

goods, the S. & J. Index Number where known, the quantity required and the price, and if it is required for stock the quantity which he then has on hand. He is also required to state his reasons for making the application ; such as, for example, the purpose for which the dye is required and whether he has tried an equivalent British dyestuff, and if so in what manner it fails to satisfy his requirements. These applications are, first of all, submitted to the technical advisers to the committee, one representing the users, the other the makers. If both technical advisers are satisfied that there is no suitable British equivalent, a licence is granted forthwith ; if, on the other hand, both technical advisers are satisfied that there is a British equivalent, the licence is refused. The decisions of the technical advisers are subject to confirmation by the Licensing Committee. Where the technical advisers do not agree, or where through lack of information they do not agree to come to a decision, the applications come straight before the committee.

Summary of Decisions

The following table is a summary of the decisions of the committee during the first eleven months of the year :

PARTICULARS OF QUANTITIES OF DYESTUFFS AND INTERMEDIATES FOR WHICH APPLICATIONS HAVE BEEN MADE FOR LICENCES.

	Total Applied for.		Granted.		Refused.	
	lb.	Value £	lb.	Value £	lb.	Value £
First Quarter	1,220,527	363,843	718,816	296,332	501,711	67,511
Second Quarter .	366,516	102,913	202,952	64,855	163,564	38,058
Thi d Quarter ...	803,728	261,102	391,666	158,777	412,062	102,325
October	708,309	287,710	586,384	246,085	121,925	41,625
Total	3,099,080	1,015,568	1,899,818	766,049	1,199,262	249,519

The Dyestuffs Industry Development Committee

The work of the Development Committee, as will be readily understood, could not commence until the work of the Licensing Committee had been advanced some way. The statistics which the Licensing Committee collect as the result of its work are the foundations on which the Development Committee has to build. The Development Committee has very carefully considered the details of the colours which have been admitted into this country this year, and as a result there were two lines of work open to the Development Committee to follow. It could either take as a basis the list of dyes not being made in the country, and endeavour to foster their production here ; or it could take as its starting point the dyes which are at present being made in this country, some of them not of equal quality to the foreign dyes, and stimulate work on these dyes in order to bring them up to the standard of production which the foreign dyes have reached. The Development Committee has very wisely chosen the latter course. At present there has been prepared a list of all the dyes which are being made in this country, together with their foreign equivalents. This list has been drawn up by the dye-making representatives, and is at present in the hands of the dye-using representatives on the committee. A good deal of evidence will have to be produced by the makers and investigated by the users before this list is complete, but when it is complete it will become a standard list of what dyes are being efficiently produced in this country, and for which no licences to import foreign equivalents need be granted. When the British dye-makers have perfected the range of dyes being made at present, which is very much larger than most people imagine, then it will be possible for the committee to consider on what dyes, in order of their importance, development work should be started. In this connexion the committee is considering the works programme of each British dyemaker in order to advise and assist them in carrying out a united programme.

The question of the production of pure intermediates is a matter of the greatest importance both in bringing some of the dyes at present made in this country, but of not sufficient purity, up to the required standard and in preparing for the introduction of new British dyes. This entails consideration of the problem of research in the Synthetic Organic Chemical Industry, which is also receiving the attention of the Development Committee.

The Safeguarding of Industries Act

The Safeguarding of Industries Act has not followed the lines of the Dyestuffs (Import Regulation) Act, 1920, in imposing a prohibition against the import of certain articles, but has proceeded by way of a tariff. In essence the Act is divided into two parts, the first part (Key Industries) imposing a tariff of 33⅓ per cent. on certain classes of articles mostly of a scientific character, a general description of which is given in a schedule appended to the Act. This schedule is further expanded by a list of articles which the Board of Trade consider as coming within the schedule ; the list in effect has the same legal standing as though it were included in the Act. This part of the Act came into force on October 1, 1921. Part II, which came into force immediately the Act received the Royal Assent, deals with dumping, whether by reason of the depreciation in foreign exchanges or by selling below the cost of manufacture.

Key Industries

Much interest has been shown in the list prepared by the Board of Trade and the inevitable controversy has arisen as to the inclusion or omission of many articles from the list. This was anticipated in the Act, and provision was made for the appointment of a referee to adjudicate in the matter, and already several cases have been before the referee. In the first case it was claimed that santonine was not a fine chemical within the meaning of the Act and therefore should be removed from the list. The referee upheld this contention and santonine disappears from the list. It is rather difficult to estimate what flows from the decision, which, strictly speaking, governs only the case of santonine, but there are several articles of a similar character in the list, the position of which is precarious unless additional arguments and evidence are furnished to the referee as to what the word " chemical " in the Act really means. The second case dealt with gas mantles, which it was claimed should have been included in the list and were not so placed. In this case the referee held that inasmuch as thorium and cerium oxides were included in the schedule, and as they had not lost their identity by being made into a mantle, the mantles were liable to duty, but he also held that the basis price on which the duty should be charged was not a matter for him to decide. This will therefore raise an interesting problem for the Customs Authorities. The third case which has been before the referee is that of calcium carbide. In this case the appellants claimed that calcium carbide was a synthetic organic chemical, basing their argument on the fact that organic chemistry is frequently described as the chemistry of the carbon compounds. At the time of going to press this case is still *sub judice*.

Anti-Dumping

Part II of the Act provides for the investigation of claims that any goods (other than articles of food or drink) made abroad are sold or offered for sale in the United Kingdom either below the cost of production of by reason of depreciation in currency below the cost of manufacture at home. The machinery for these investigations is a committee of five persons chosen from a permanent panel of thirty-three. Two of these committees have already sat, one dealing with fabric gloves the other with glassware. The various points

which the committee has to consider are laid down in the Act, and to establish a case it is necessary to prove :

(*a*) That the article is sold or offered for sale below cost of production or at prices which, owing to depreciated exchange, are below cost of profitable manufacture in this country.

(*b*) That for this reason employment is or is likely to be seriously affected.

(*c*) That if the depreciated exchange is the alleged cause, a certain degree of depreciation has been reached.

(*d*) That the effect of the imposition of the duty on any other industry has been considered.

(*e*) That the British industry to be assisted is being carried on with reasonable efficiency and economy.

When this has been done to the satisfaction of the committee, and the Board of Trade have seen that no treaty will be varied by its action, the Board may make an order applying Part I of the Act to the goods and imposing a duty of 33⅓ per cent.

The Result

Twelve months' working of the Dyestuffs Act has at least shown that it is possible to work a system of protection by licences where one class of goods alone and one body of consumers are involved. In the case of the Safeguarding of Industries Act the time has been too short to draw any useful conclusions, and moreover the present extraordinary rate of exchange between this country and the Continent has vitiated the experiment to a large extent. Time alone will show whether with a return to more normal conditions British Industry can be re-established with the assistance of the Act.

Chemical Trade Movements in 1921

By " W. G. W."

THE chemical industry will probably remember for many a year the vicissitudes of the trade during 1921. There is not a business man in the trade who can remember a period of such difficulties and trials caused by the practical cessation of buying and ever-falling values.

At the commencement of the year, business was more healthy than it had been during the previous two or three months, and there were hopes that the worst had been passed. These hopes, however, were short-lived, for, from about the third week in January, markets again started to decline with ever-increasing rapidity. A slightly better tendency was in evidence in the latter half of March, but the coal strike in April brought the improvement to a sudden end, owing to many factories being forced to shut down or to resort to short time, and this state of affairs continued until the strike was settled in July, when again a slight recovery was apparent.

In that month, however, there was a fresh break in the continental exchanges, with the result that continental competition became intensified and prices again suffered, thus causing many buyers to restrict their purchases to the lowest possible degree.

From September onwards, however, the business, although extremely quiet, has shown a steady if slow upward tendency, and values have been much more stable, thus enabling buyers to book their requirements ahead with some confidence. We think it may safely be said that the end of September marks the bottom of the curve as regards the depression in this trade.

The chemical-consuming industries in certain sections also appear to be slowly recovering, so that the natural demand continues to expand.

The continental exchanges have also improved during the last few weeks, with the result that English prices are now much nearer those of their continental competitors, and the way seems now clearer than it has been for a year or more past for a slowly progressive resumption of activity.

The Fine Chemical trade has, throughout the year, been an extremely unsatisfactory feature. Stocks, considering the meagre volume of trade passing, have been very heavy, and prices, until quite recently, have had a steady tendency to fall.

The passing of the Safeguarding of Industries Bill into law has had very little effect on prices so far, considering the general expectations. This has been mainly owing to the fact that very heavy quantities of continental goods were brought into England before the Act became operative, and some prices even declined in face of the fierce competition to realise.

The export trade has been unsatisfactory throughout the year, although during the last month or two there has been a most welcome improvement from some markets. During the main portion of the year, however, the chief continental markets have been unable to purchase from this country owing to their depreciated exchanges, while for various overseas markets the fierce German competition has prevented this country from securing its normal share of the trade.

With the ever-rising German prices, however, these now tend to meet the reduced English prices, and the position is slowly becoming better, although the factor of exchange is still the main vital element governing the export business.

After careful consideration, we have come to the conclusion that the outlook is brighter than it has been for many months past, and that the trade can enter upon the New Year with a greater feeling of confidence. With the settlement of various of the world's troubles stability should be restored, and thus during the next few months trade should not only be on a much better basis, but also considerably safer, seeing that prices are in the main now as low as they can be expected under existing circumstances.

ACETONE has been a fluctuating market, commencing the year at round about £90 per ton, from which point it continued fairly steady until May, when the value sharply advanced to £100 per ton. It slightly declined, however, in July to £95 per ton, and has since declined to the present level of £85 per ton. The article at present is extremely scarce and in brisk demand.

ACIDS have been generally a very difficult market with many fluctuations.

ACETIC opened the year at about £50 per ton for 80 per cent. technical and slowly declined under stress of continental competition to about £40 per ton in September. Under the Safeguarding Bill 80 per cent. is liable to duty, while 60 per cent. and under is not, and we close the year with 80 per cent. standing at about £44 per ton on the spot and 60 per cent. at £32 per ton. Trade has been on the light side throughout the year, and supplies in the main have been coming from the Continent.

CITRIC has been a fairly steady market if rather a quiet one. The market opened at about 2s. 4d. per lb., and was steady until May, when it slowly advanced to 2s. 6d. It has been since slowly declining, and the value can be taken to-day at 2s. 4d. per lb., at which figure it is relatively cheap.

FORMIC has continued fairly steady with a moderate request throughout the year, and the market has been more or less under the influence of German competition. Business commenced in January at round about £75 per ton for 80 per cent. and by June had declined to £68 per ton. Since that date values have slowly receded until the product is now worth round about £55 per ton with an easy market.

LACTIC has been uninteresting during the whole of the year and trade has been generally very quiet. The value in January for 60 per cent. was nominally at £50 per ton, but it smartly declined in February to £40 per ton, round about

which figure it remained until May, when there was a very slight improvement, and the price was again a shade firmer in October, and was then standing at about £43 per ton, and owing to the absence of demand it has since fallen back again despite the duty, and can now be taken at round about £35 per ton for 60 per cent. Trade has been under the influence of German competition the whole of the year.

OXALIC has been a slowly declining market. Commencing the year at 1s. 2d. per lb. it sharply slumped in February to 10d., standing round about this figure until July, when the price again declined to 8½d. per lb. and by September the value was about 7½d., and although the article comes under the provisions of the Safeguarding Act, the value has not increased to any extent worth mentioning; forward quotations, however, from the Continent are higher, and it would now seem as if we had touched the bottom values for the time being. Throughout the year the English manufacturers' prices have been well above those of their Dutch and German competitors.

SALICYLIC has been a very inactive market throughout the year. The value in January was round about 1s. 9d. per lb. for B.P., and it has since slowly declined mainly owing to lack of sustained buying to the present value of 1s. 5d. per lb. The fact that this article is protected by the Safeguarding Act has not affected it materially beyond probably holding the value up to its previous level.

TARTARIC has been only in moderate request throughout the year; the value in January was round about 2s. per lb., and has slowly declined to about 1s. 9d. per lb. in April, and is now a fairly steady market at 1s. 5d. per lb., at which figure it looks relatively cheap.

ALUM has remained fairly steady on home trade account during the year, and has suffered little loss in value on home trade account. To-day's value for Lump may be taken at about £18 per ton, while Continental can be obtained for a little less.

ALUMINA SULPHATE has also maintained its price fairly well, although during the last six months or so Continental competition has made itself very evident. Makers are fairly well occupied, however, and the present-day value may be taken at about £12 per ton for 14/15 per cent.

AMMONIUM SALTS have been an unsatisfactory market in general, and prices have been inclined to drop throughout the year.

CHLORIDE slumped badly in January to about £50 per ton for Continental material, and this figure remained more or less stationary until the end of the year. Continental manufacturers, however, now appear to be well occupied, and the article shows at the moment a firmer tendency than has been the case for twelve months or more.

CARBONATE has been a very unsatisfactory market from the English manufacturers' point of view. At the early part of the year there was fierce competition by the German producers at considerably below the English manufacturers' price. The home trade figure, however, was reduced about the middle of the year to 4d. per lb. for Lump, which had the effect of stimulating the trade slightly and checking the flow of orders to foreign producers. The general trade, however, can only be described as unsatisfactory.

PHOSPHATE has been, considering all the factors, fairly steady; commencing the year at about £100 per ton it declined slowly to October to about £70 per ton, and after the passing of the Act has risen slowly until to-day the figure may be taken at £85 per ton, which can only be considered as relatively cheap.

ARSENIC has been as usual a fluctuating market. In January the value was about £75 per ton, from which it slowly declined by progressive stages to £60 per ton in March, while by September it had reached the figure of £35 per ton. The product afterwards firmed up, and is to-day in considerably better request at round about £42 per ton. The foreign competition for White Powder has not been very severe, the main factor being the extremely light demand.

BARIUM SALTS have been in the main unsatisfactory.

CHLORIDE has been a declining market for the greater part of the year. Business commenced at about £20 per ton, and under the influence of severe German competition has declined by successive stages to £12 per ton in November. Owing to many of the Continental works overselling themselves and to the recovery in exchange, the price has since improved to round about £14 per ton.

NITRATE.—The price of this article has suffered in the main owing to the stagnation in demand. In January the value was about £40 per ton, while to-day it cannot be considered better than about £30; business, however, throughout the year has been negligible.

BLEACHING POWDER.—This product has been a most unsatisfactory article from the point of view of Home Trade producers, and probably there has been the smallest output in this country during 1921 than for many years past. The price in January was round about £22 per ton, with forward material offering at lower figures. This figure slowly declined under the pressure of foreign competition to about £14 per ton or even less in September. It has steadied somewhat since then, and the English makers report a slightly increased volume of business. The export trade from this country has been most unsatisfactory, the great majority of the business going to Germany. As, however, the German factories now appear to be heavily committed it is probable that again more export orders will find their way to England than has been the case for many months past.

COPPER SULPHATE has been a very unsatisfactory article throughout the year; commencing the year at round about £32 to £33 per ton, the market stands to-day for English material at £28 or even a little less. The volume of business transacted in 1921 has been one of the smallest on record. This has been in the main accounted for by the fact that owing to the depreciated foreign exchanges Germany and Italy have been able to compete to the disadvantage of this country, while the heavy stocks held in France and Greece have militated against any great amount of business being placed. At the time of writing this report, although the outlook appears to be slightly better, it cannot be said that we face the new season with any great feeling of confidence.

EPSOM SALTS have moved off fairly well considering the general depressed state of trade. In January the market was fairly firm at about £12 per ton, while in June it declined to about £9 10s. per ton. To-day the value may be taken at round about £9 for the Techincal quality. In regard to export, most of this business has been taken by Germany, and comparatively speaking only a small quantity of the foreign material has found its way into this country through side channels.

FORMALDEHYDE has been a slowly declining market but without any very violent fluctuations, and this is the more remarkable considering the fact that trade has been extremely quiet throughout the year for this product. Trade commenced at round about £120 per ton, and the price has since slowly declined with slight variations until to-day the figure is standing at round about £80 per ton. The effect of the Safeguarding Act on this product was extremely slight, as in the case of many other articles.

IRON SULPHATE has been fairly steady throughout the year, although the total volume of trade, as could only be expected, has been below the normal. The average value throughout the year has been round about £4 per ton, which can hardly be considered excessive under existing conditions.

LEAD SALTS have been extremely unsatisfactory. Acetate commenced the year at round about £60 per ton, and has slowly declined until White can to-day be purchased at about £45 per ton. The market throughout the year has been under the influence of German competition, and only an extremely small amount of material has been manufactured in this country. Considering the pre-war value of this article it can hardly be said to be over valued to-day.

NITRATE.—While the trade in this product has been of small dimensions, the price has remained relatively steady; the value in January was £55 per ton, and to-day it stands at round about £48 per ton. The export trade in the product has been negligible.

LITHOPONE has been a disappointing article. In January the price was anout £40 per ton, but immediately it heavily slumped to about £28 per ton in March; since that time, owing to the light demand and heavy German offerings, the value has slowly declined until to-day good quality material can be purchased at round about £23 to £24 per ton for 30 per cent. Light resisting. The tonnage consumed during the period has been much below normal.

POTASSIUM SALTS have been in only moderate demand, and as may be expected the prices have been of a very fluctuating nature.

BICHROMATE was standing in January on the open market at about 1s. 3d. per lb., from which figure it slowly declined until in March it was an easy market at 9d. per lb.; at this figure the product remained fairly steady but again declined in October to 7¾d. per lb. The makers about this time reduced their quotation to this figure and the product is now fairly

steady. During the year there has been some small competition from America and Germany, but the quantity imported has not assumed very large proportions.

CARBONATE has only been a small market and has been declining throughout the year until about the middle of November. In January the value was about £75 per ton on the basis of 80 per cent., while in November it was standing at about £30; since that date the German producers have raised their quotations, and with a slight improvement in the demand the market has firmed up a trifle. Stocks are thought to be light, as with the continued declining values importers have not been encouraged to bring any large quantity forward.

CHLORIDE has been a small trade and is to-day round about £25 per ton.

PRUSSIATE has been a more satisfactory product than many and the price variations have been small. In January the value was 1s. 6d. per lb., and the product has slowly declined, until to-day it can be purchased at 1s. 2d. per lb. on the spot. At this figure it is firm and in short supply.

CAUSTIC has followed much the same course as Carbonate. At the commencement of the year the value for 88 per cent. was about £85 per ton, and since that date it has declined steadily until in November this strength stood at £30. Owing to increased demand and short supplies the price has since advanced, and it is a firm market to-day at £34 per ton ex docks.

PERMANGANATE has followed the general course of Potash products, in that it has been a steadily declining market. Commencing the year at 2s. 9d. per lb. the material slowly declined, and in September was standing at round about 1s. 2d. per lb. with a weak market. As this product comes under the Safeguarding Act it has steadied somewhat since, although the price has still further declined. To-day's value may be taken at round about 1s. per lb. or even a little less for B.P.

SODIUM products have been an unsatisfactory feature on the whole throughout the year, and values have suffered seriously.

ACETATE commenced the year at £45 per ton, from which figure it quickly declined to about £30 by June. It has since further declined mainly owing to lack of trade, and is fairly firm to-day at £25 per ton.

ARSENATES have been slow in demand throughout the year, and the export trade has been extremely unsatisfactory. At the time of writing this report, the demand would appear to be slowly improving.

BICARBONATE has maintained its value fairly well during the year.

BICHROMATE has been a weak market and mainly under the influence of re-sellers. In January the figure was about 10d. per lb., and it has since declined to the present value of 6d. per lb., which is the makers' quotation. There has been a certain amount of competition with the American material, but, of course, the main factor has been an extremely poor consuming demand.

BISULPHITE.—Although the price has declined the volume of business passing for this material has been fairly satisfactory, and it is a very satisfactory feature to note that many foreign consumers are willing to pay a small premium for the English product as against some of the German material which cannot be relied upon for quality. Business commenced in January at about £35 per ton, and makers have been able to reduce their price from time to time until it stands round about £22 per ton to-day.

CHLORATE has been an extremely poor market, and throughout the year business has been of the hand-to-mouth variety. To-day's value is round about 3d. per lb.

CAUSTIC has been unsatisfactory both on home trade and export account. In January the market was about £26 per ton, and has stayed round about this figure for some months. To-day it can be purchased at about £24 per ton. Export trade throughout the year has been of extremely small proportions, while, of course, owing to the prevailing stagnation the home trade demand has also suffered exceedingly. Very little material has been exported to the Continent, while American competition in South America and the Far East has been severe. The signs are now somewhat better, however, with a progressive increase in the demand.

HYPOSULPHITE has been a fair market considering the times, and it is a very satisfactory feature that in the main English manufacturers have been able to hold their own. At the commencement of the year the price was about £24 per ton for Commercial, and thereafter it slowly declined until in July it was standing at about £18 per ton. German competition then became increasingly severe, and figures as low as £14 per ton were accepted. Lately, however, the competition from the Continent has eased off considerably, and we close the year with a very firm market at about £14 10s. As regards Photographic, here the Continental competition has been more severely felt, and the value for Pea Crystals was about £28 per ton in January, but the price was forced down to even as low as £16 per ton by the middle of the year. The Photographic quality, however, was protected in the Safeguarding Act, and the main business now passing is for English manufacture and the value of Peas to-day is fairly firm at £19 per ton.

NITRITE.—Business in this product has been of extremely small dimensions throughout the year. Very heavy stocks have been in evidence very largely owing to the fact that the Dyestuff Industry was only consuming small quantities. The price has declined from about £55 per ton down to the present level of about £36 per ton, at which price supplies can be readily obtained.

PHOSPHATE.—This product has been extremely unsatisfactory in the main owing to the very poor consuming demand, and a number of contractors were unable to take up their contracts in time. Under the stress of competiton the market has declined from £35 per ton to the present-day level of £18 per ton, at which figure it must be considered fairly cheap. There has been only a moderate amount of foreign competition, mainly emanating from Belgium.

YELLOW PRUSSIATE has been only a small market, and has been standing in the neighbourhood of 8d. per lb. for several months past. There has been quite a fair export demand, particularly from America and the Far East, and it is believed that stocks are extremely light. Very little active competition has been felt from the Continent.

SULPHIDE has followed the usual course of Soda products. Concentrated has declined by successive stages from £34 per ton to the present value of £24 per ton, while Crystals declined from £22 to about £14 per ton to-day. A certain amount of Concentrated has been imported, but only intermittently. The consuming demand, on the whole, has been extremely poor. Export trade has been very unsatisfactory, and until recently the Belgian and German producers secured a large number of orders that in the ordinary way would be placed in this country. Luckily, however, the Continental competition has declined somewhat of late, so that an increased volume of export business might reasonably be looked for early in the New Year.

SULPHITE.—This product has been in fairly steady request and the market has not been troubled to any extent by foreign competition. To-day the value may be taken at £13 per ton, and £20 per ton for Photographic.

TIN SALTS have been dull and uninteresting with business of the hand-to-mouth variety.

ZINC SALTS have been in the main unsatisfactory, and prices have slowly declined.

CHLORIDE has been a poor market, and for the Solid most of the business has gone to the German producers. The value has declined for the Solid from about £50 per ton to about £30 per ton to-day.

SULPHATE has also been a quiet market, although the values have kept up very well considering. The value is about £18 per ton, with an extremely small business passing.

Chemical Trade Wages

AT a meeting of the Joint Industrial Council for the Chemical Trades held recently in London, the employers brought forward a proposal that the present rate of wages should be reduced by 2d. per hour on January 1, 1922, and a further 1d. per hour on February 1 if the cost of living figure for January 1 is lower than that for December 1, 1921. It was further proposed that piece-workers be subject to a reduction based on the time reduction, but with particular consideration in each case, and that in the case of boys and youths the following scale for a forty-seven hours week be substituted for the one now obtaining:—Age fourteen, 11s. 9d.; fifteen, 15s. 8d.; sixteen, 17s. 7d.; seventeen, 21s. 6d.; eighteen, 25s. 6d.; nineteen, 30s. 4d.; twenty, 35s. 3d. Mr. Kelly, one of the workpeoples' representatives, said the employers had definitely stated that during 1921 they would not ask for any further reduction, and he therefore desired the chairman's ruling as to whether the discussion could proceed under the circumstances. The chairman ruled that the notice of motion was out of order, and that discussion could not proceed. After private consultation the employers' representatives, it is stated, accepted the Chairman's ruling under protest.

Invention in 1921

By our Patent Correspondent

THE close of the year 1921 again brings us the opportunity of reviewing the progress of chemical industry as revealed in the specifications of patents for inventions which have been published during the year. Although the year has been one of great depression as far as trade is concerned, the activity of inventors has been in marked contrast to the trade depression, and has furnished clear evidence of an optimistic outlook on the future. A large proportion of the war-time inventions which have been filed since the close of the war by foreign inventors—mainly German—have been accepted during the year and the patents are now in force, so that we are able to estimate the progress made in other countries as well as in our own. The subject-matter of the inventions of the year is so extensive, covering as it does every branch of chemistry, that it is only possible in this short retrospect to notice briefly a few of the more striking developments.

Catalysis and Catalysts

No one who has perused the "Patent Literature" of THE CHEMICAL AGE during the past year could fail to have observed the ever-increasing use of catalytic substances, particularly in reactions for obtaining synthetic products or oxidation products. Examples are found in the synthesis of aldehyde and acetic acid from acetylene, air and steam in the presence of a vanadate, molybdate, or chromate as catalyst, and in the oxidation of acetaldehyde in liquid form to acetic acid by using a mixture of kaolin and sodium silicate, or, in another case, manganese acetate as catalyst; other inventors use nickel, cobalt, or chromium acetate for this purpose, and to prevent the formation of peracetic acid. Another inventor proposes to oxidise butyl alcohol with oxygen in the presence of steam and a platinum catalyst; and then to heat the butyric acid thus obtained with hydrogen in the presence of palladium to obtain fatty acids of the palmitic series. Considerable research has been evident in the use of vanadium and molybdenum oxides as catalysts for reactions of this kind, and in one invention the oxide is supported on a carrier of granular aluminium when used for oxidising benzene to maleic acid, anthracene to anthraquinone, or naphthalene to phthalic acid. Another inventor finds that such oxidation reactions as these, and also the manufacture of sulphur trioxide, are much accelerated and a higher yield obtained if the vanadium pentoxide is first fused at 500°C. and then broken into small pieces. The high cost of some of the catalysts has resulted in an invention for using vanadyl chloride instead of the oxide. The fact that the former is volatile considerably reduces the quantity required.

Considerable attention has also been directed to increasing the efficiency of other catalysts, and much ingenuity has been exhibited. For example, the efficiency of copper oxide may be increased ten times in hydrogenation processes by first fusing the oxide and then breaking it up. In the hydrogenation of oils, the deposition of metallic soaps on the catalyst may be prevented by the addition of mono or di-glycerides of fatty acids. Oxidation reactions may be caused to take place at much lower temperatures by using as catalyst oxides of manganese, cobalt, copper, &c., which have been specially dehydrated. An ingenious invention for maintaining the quality of powdered nickel catalyst during transport or storage consists in reducing a nickel compound by means of paraffin wax heated to such a temperature that it is partly cracked. The nickel remains suspended in, and protected by, the remaining wax, which is subsequently removed by centrifuging.

Ammonia

The synthesis of ammonia continues to claim attention, mainly by developments in detail on the lines of the Haber and Claude processes. One inventor claims a very high yield by using as catalyst iron oxide (Fe_3O_4), which he has prepared by a special process. It is also claimed that by the use of a catalyst obtained by heating substances such as ferrous cyanide, ferrocyanhydric acid, or ammonium ferrocyanide to 500°C. in a neutral atmosphere, the ammonia synthesis may be effected below 400°C. and a pressure of 100 atmospheres. A similar claim is made in respect of a catalyst consisting of potassium ferricyanide or calcium ferrocyanide which have been activated by heating to 360°C. in an atmosphere of nitrogen. If these claims can be substantiated in large-scale working, a considerable improvement even in the Claude process may be looked for. Other catalysts proposed for use in ammonia synthesis consist of iron and potassium cyanide, or iron of great purity, obtained by a special process and completely free from sulphur. A departure in a direction which is largely unexplored is shown by an invention for subjecting reacting substances to ultra-violet radiation. It is claimed that numerous reactions which are normally difficult to effect take place more readily in these circumstances—*e.g.*, the hydrogenation of unsaturated fatty acids and the synthesis of ammonia.

Fertilisers

Much attention continues to be directed to the manufacture of chemical fertilisers, both nitrogenous and phosphatic. One of the difficulties to be overcome with many natural and other phosphates is to render them assimilable, and to effect this one inventor proposes to heat natural calcareous or bone phosphates to 1,000°C. in contact with sulphur dioxide, air and steam. A mixture of monocalcium phosphate and calcium sulphate is obtained which is stated to be equivalent to superphosphate. Several inventions are also on record for improvements in the conversion of cyanamide into urea. In one case cyanamide heated with calcium nitrate and steam under certain specified conditions gives a quantitative yield of urea, while the calcium nitrate is also a fertiliser. In another case a quantitative yield of urea is obtained by saturating cyanamide with water and sulphur dioxide, and heating to 80°-90°C. under a pressure of 5-20 atmospheres. If higher temperatures or pressures are used, ammonia is obtained. In another invention slag phosphates are converted into a colloidal product by grinding with water containing 0.1 to 0.3 per cent. of sulphuric, nitric, or phosphoric acid, or alkali. The product is equal to a water-soluble phosphate as a fertiliser. A patent by the Badische Anilin & Soda Fabrik for the manufacture of a dry non-hygroscopic compound of ammonium sulphate and ammonium nitrate recently published is of interest in view of the fact that the explosion at Oppau was due to the detonation of this substance.

Gas Works By-products

The recovery of by-products obtained in the distillation of coal continues to be studied with a view to economies in the processes or greater purity in the products. Few improvements have been noted in the manufacture of ammonium sulphate, apart from minor details in the apparatus, but in one case the sulphate is dried by allowing it to fall through a tower against an upward current of hot air. Several inventors have directed their attention to improvements in the removal of impurities from coal gas. In one invention, coal gas under pressure is washed with glycerine to extract ammonia, carbon dioxide and sulphuretted hydrogen. When the pressure is removed, some of the gases are released, while ammonium carbonate or sulphate remains in solution in the glycerine. Another invention which is said to be commercially practicable, though at first sight it would appear too expensive, proposes to remove the sulphuretted hydrogen from gas by absorption in certain dyestuffs such as methylene blue, methylene violet, Meldola's blue, indigo carmine, and sodium salts of sulphonic acid derivatives of these dyes, with a catalyst such as pyridine. The change in colour of the dye serves as an indicator to show when it becomes spent, and it may then be revived by oxidation with air. The alternate oxidation and reduction may be repeated many times over so that the initial cost of the dyestuffs is not prohibitive. An invention to eliminate cyanogen compounds from ammoniacal gases consists in adding a polysulphide to the liquid before distillation, or passing the gases through a polysulphide on the way to the saturator. The cyanogen is retained in solution as sulphocyanide.

Several proposals have been made to obtain by-products direct from coal by special treatment. In one case the coal is treated with acetone or ketones saturated with sulphur dioxide, and in another case low-boiling hydrocarbons are obtained by heating coal with alkali in the presence of hydrogen. In yet another case, coal is distilled with salt and silica, and ammonium chloride distils off. A process for the recovery of ethylene from coal gas depends on its absorption in charcoal or alumina, and subsequent liberation of the ethylene by immersion of the absorbent in molten metal. The object of the molten metal is to ensure a regulated temperature and rapid heating, and the process can also be applied

to the distillation of tar by passing the tar in a thin film into the metal.

Mineral Concentration

The concentration of minerals by the froth flotation process continues to be developed, notably as applied to tin ores. In one case, cassiterite is agitated by means of carbon dioxide instead of air, which prevents the flotation of quartz, mica, &c., and in another case a deflocculating agent such as sodium silicate is added to retain metallic oxides of iron and aluminium in colloidal suspension, while the tin ore is separated and then subjected to froth flotation. The process is also applied to the separation of coal or carbonaceous shale by using creosote, tar, or paraffin oil as the frothing agent.

Indiarubber

The study of synthetic rubber has received a set-back owing to the low price of natural rubber; but a series of patents from a German source have been published, based on the synthesis of rubber from butadiene, isoprene, &c. Several vulcanisation accelerators have been investigated, notably diortho-toluyl-thiourea, which completes the vulcanisation in ten minutes. A cold vulcanisation process depends on the alternate treatment of rubber with sulphur dioxide and sulphuretted hydrogen.

A large number of the published inventions are of a miscellaneous character, but none the less useful. The purification of a large class of organic substances by distillation, such as resorcinol, anthracene, anthraquinone, &c., is facilitated by distilling with a mineral oil, having a wide boiling range, when the impurities are readily collected separately. The various lighter impurities are separately condensed with each fraction of the mineral oil which distils over, and the resorcinol or the like is finally crystallised out of the oil in the receiver. A proposal for dealing with furnace gases containing sulphur dioxide, with ordinary pumps without danger of corrosion, depends on the fact that dry sulphur dioxide does not corrode, and all traces of moisture are therefore removed from the gas, the final traces by means of liquid sulphur dioxide. An invention with a wide range of usefulness is that for purifying hydrogen from carbon monoxide by passing it over incandescent molybdenum or tungsten or other metal in the same periodic group. Pure hydrogen is becoming more than ever necessary in modern chemical industry.

Colloidal clay is finding an increased range of usefulness for accelerating such reactions as the hydrogenation of oils, the oxidation of alcohol, the synthesis of ammonia, and the hydrolysis of glycerides.

Numerous inventions which it is not possible to notice in detail have been made for improvements in condensation compounds of the phenol formaldehyde class, and in the rapidly-growing industry based on acetyl cellulose and products derived from it. The chemist is finding an increasing sphere of usefulness in allied industries such as the manufacture of paints, varnishes, enamels, foodstuffs, oil refining, soap manufacture, &c., and much of the invention in these industries is due to chemical research.

The dyestuffs industry and the manufacture of drugs are too specialised and intricate to be discussed in the present brief review, but it may be remarked that the great majority of inventions continue to come from the principal German firms engaged in the industry, although an increasing number are received from France. The long lead established by Germany in these industries still remains, but the progress of the home industry from the inventive point of view is evidence of the increasing interest taken in this subject by British chemists. Apart from invention, advantage is being taken of the provisions of the Patents Acts by British firms in obtaining licences in respect of foreign dyestuffs patents.

Chemical and Allied Societies

Notes on their Work during 1921

British Association: Chemistry Section

THE gloomy denunciations which followed the 1920 meeting of the British Association were completely nullified by the Edinburgh resurrection of 1921. The total membership reached 2,768, and in the revival of interest and activity signified by this imposing figure the Chemistry Section played a prominent part, covering a wide field of discussion and attracting a large attendance at the meetings. The presidential address by Dr. M. O. Forster, entitled "The Laboratory of the Living Organism," constituted an appeal for the recognition of chemical principles in the countless transformations, analytical and synthetical, which permeate the life-processes of every organism, and emphasised the intellectual pleasure to which a moderate understanding of those principles may give access.

A joint discussion with the Physics Section on the "Constitution of Molecules" aroused widespread interest, Dr. Irving Langmuir presenting, in a most lucid and attractive manner, the theory for which he has become famous. The Langmuir atom enlists the sympathy of chemists by its independence of complex mathematics, and the series of admirable models, devised and exhibited by Professor A. Smithells, rendered practical assistance in realising its possibilities. The subsequent discussion was mainly from the physical and electrochemical standpoints, application of the Langmuir theory to problems of organic chemistry being as yet very restricted.

Another joint discussion, on this occasion with the Physiology Section, was opened by Professor H. Gowland Hopkins, on the subject of "Oxidation and Oxidative Mechanisms in Living Tissues," whilst the much-canvassed question of carbohydrate-synthesis from carbon dioxide and water through formaldehyde received further attention from Professor E. C. C. Baly, Professor I. M. Heilbron, and Mr. W. F. Barker. A possible course of phyto-chemical synthesis was outlined by Professor R. Robinson, and a stimulating technological contribution was made by Professor H. E. Fierz-David, of Zürich, who surveyed the present position of the world's dyestuff industry. Professor F. M. Jaeger, of Groningen, described an instrument for measuring surface-tension at temperatures ranging between 80° and 1,650°C., Dr. J. F. Tocher discussed the "Citric Solubility of Mineral Phosphates," and Professor G. T. Morgan presented the report of the committee dealing with "Non-Aromatic Diazonium Salts."

A visit to the factory of the North-British Rubber Co. was very largely attended, and it was generally agreed that the meeting must rank amongst the most successful in the record of the Chemistry Section.

The Institute of Chemistry

THE "Journal and Proceedings" of the Institute of Chemistry for the year 1921 bears evidence of the increasing activity of the Institute in the interests of the profession of chemistry. Under revised by-laws, adopted towards the close of last year, the constitution of the Council has been enlarged by the addition of nine district members, resulting in an infusion of new ideas and in a measure stimulating the whole organisation, since these new members are in direct touch with the recently formed local sections which, in turn, provide opportunities for discussion on matters of local and general interest.

Financially, owing to the foresight exercised in 1919 in raising the amounts of the subscriptions of the Fellows and Associates, the Institute is recovering from the result of being left with an uncompleted building at the beginning of the war, and the subsequent heavy additional expenses of maintenance common to institutions as well as individuals. A considerable addition of new Associates has been made in the register, which now contains the names of approximately 1,600 Fellows, 2,000 Associates, and 900 Students.

The subjects discussed by the Council and referred to in the "Journal," include many of importance to all branches of the profession. Thus, in governmental matters, the Safeguarding of Industries Act (in its relation to fine chemicals, laboratory glass and porcelain), the Dangerous Drugs Act, the Committee on Causes and Prevention of Blindness (Ministry of Health), the Burnham Secondary and Technical Committees, the Departmental Committee of the War Office on the Directorate of Chemical Inspection, Woolwich, the Department of Scientific and Industrial Research, and the National Physical Laboratory, the Coal Mines Department, and the Gas Referees—all find a place in these records of deliberation and representation. Useful articles have appeared on Remuneration and Contracts of Service. The

affairs of public analysts, official agricultural analysts and gas examiners have also received attention, as well as those of chemists holding appointments in India and in the Overseas Dominions.

The Appointments Register has been the means of helping both employers and chemists. The benevolent fund, founded last year, as a memorial to members and students who fell in the war, has made fair progress; the committee for administering the fund has made disbursements in several cases of hardship.

The Institute is about to co-operate with the Board of Education in a scheme for awarding national certificates in chemistry and applied chemistry to students in technical colleges and schools in England and Wales. The Institute has also accepted the responsibility of awarding a medal, provided by the Society of Maccabæans, in memory of Professor Raphael Meldola, the primary object of which will be the encouragement of original work in analytical chemistry. The Institute has had a busy year.

Society of Chemical Industry

In a word, I do not believe that the Society of Chemical Industry has been greater in the past than it is to-day.

The outstanding event of the year has been the Annual Meeting in Canada and, although the period of the visit was short and the visitors were few, it was crowded with experiences for our members, and the effect of the interchange of ideas between the Home and the Dominion Sections will be beneficially reflected in the future policy of the Society. It will be agreed that the small party which left England was one which lost no opportunity to promote the welfare of the Society, and Sir William Pope should be again congratulated upon his admirable leadership on this occasion.

The bequest of the late Dr. Messel, F.R.S., is another event of the year of great importance to the members of the Society. Arrangements have been made for the delivery of the first Messel Memorial Lecture, together with the award of the Messel Medal, at the Annual Meeting to be held in Glasgow in July, 1922.

The financial position of the Society may be considered to be more satisfactory than in past years. Great equanimity of soul results from the possession of a sound bank balance which is, in fact, a necessary adjunct of a progressive policy. It is on this account that the Council has decided that the main revenue from the Messel fund should, for a while at least, be allowed to accumulate.

Changes have been made in the organisation of the Society's committees. It has been considered that with the war over and with travelling facilities easier, the management of the Society should be more directly in the hands of the Council.

The next Annual Meeting to be held in Glasgow will be one of special interest. Dr. Ruttan, the President, will journey to this country in the early months of the year, and will remain for the meeting. In addition to the Messel Memorial Lecture, the Glasgow Section has formulated such a programme that, given an improvement in the economic and industrial conditions of the country, the coming year will be one of great progress in the annals of the Society.

E. V. E.

The Chemical Society

The Chemical Society was founded in 1841 and received its Royal Charter in 1848. The object of the Society, as laid down in the charter, is the general advancement of chemical science by the discussion and publication of new discoveries, and the interchange of valuable information respecting them. Under the terms of the supplemental charter granted in 1920, the membership consists of fellows and honorary fellows. Fellowship is now open to members of either sex, and the first election of women as fellows took place in December, 1920. Every candidate for election as a fellow must be proposed according to a form of recommendation subscribed by not less than three fellows of the Society to whom he is personally known. In the case of a candidate resident abroad who is unable to obtain three signatures, the council has the power to accept a certificate signed by one fellow of the Society. The admission fee is £3, and the annual subscription £3. The total membership now exceeds 3,950.

The affairs of the Society are conducted by a council, elected by fellows from their own body, consisting of the president, not more than twelve vice-presidents, the treasurer, secretaries, and eighteen ordinary members of council.

Ordinary scientific meetings are held, as a rule, twice a month from October to June. At the meetings, papers are read and discussed and lectures delivered by men eminent in chemistry and the allied sciences. The Society publishes a monthly journal consisting of original memoirs communicated to the Society, and of abstracts of papers bearing on chemistry appearing in recent British and foreign journals. The annual reports dealing with the recent progress of chemistry in its various aspects are published in March of each year. The Society possesses a library of some 28,000 volumes, which may be borrowed under certain regulations.

The present officers of the Society are: President, Sir James Walker, D.Sc., F.R.S.; treasurer, M. O. Forster, D.Sc., F.R.S.; secretaries, James C. Philip, O.B.E., D.Sc., F.R.S., and J. I. O. Masson, M.B.E., D.Sc.; foreign secretary, A. W. Crossley, C.M.G., C.B.E., F.R.S.; assistant secretary, S. E. Carr, F.C.I.S.; librarian, F. W. Clifford. S. E. C.

Association of British Chemical Manufacturers

The Association of British Chemical Manufacturers (166, Piccadilly, London, W. 1) is the recognised representative organisation of British Chemical Industry. The capital invested in the 155 firms who are members is over £100,000,000. The Association is divided into twelve groups representing manufacturers of acids, alkalis, fats, soaps, &c.; paints, varnishes, &c.; coal tar primary products; fine chemicals; phosphorus, manganese, nickel, &c.; cellulose, celluloid, &c.; explosives, dyes, and intermediates; refractory materials; ammonia products; and allied industries. The principal objects of the Association are:

(1) To promote co-operation between British subjects engaged as manufacturers in the chemical or closely allied industries.

(2) To place before Government and Government officials and others, either in the British Dominions or elsewhere, the views of members of the Association and others upon matters affecting the chemical industries.

(3) To develop technical organisation, to promote industrial research, industrial efficiency, and the advancement of applied chemistry.

(4) To keep in touch with the progress made in chemical knowledge and practice and to facilitate the development of new British industries and the extension of existing ones.

(5) To improve the methods of education in chemistry and its allied subjects, so that the methods shall be better adapted to the practical necessities of the chemical industry and to encourage the sympathetic association of members of the Association and others engaged in the chemical industry with the various universities and technical colleges, either in the British Dominions or elsewhere, and to arrange conferences between manufacturers and teachers.

(6) To act as arbitrator or to appoint arbitrators to act in the settlement of disputes arising out of transactions in, or relating to, the chemical industry.

The officers of the Association are: Hon. President, the Right Hon. J. W. Wilson, P.C., M.P.; Hon. Vice-President, Mr. Robert Grosvenor Perry, C.B.E.; Chairman, Sir John Brunner, Bart.; Vice-Chairman, Mr. Max Muspratt; Treasurer, Sir William Pearce, M.P.; General Manager, Mr. W. J. U. Woolcock, C.B.E., M.P.

The Chemical Engineering Group

The activities of the Chemical Engineering Group of the Society of Chemical Industry during the year just passed have consisted mainly in a consolidation of the position attained during the previous years of its existence, and in laying the foundation for increased endeavour when the difficult times, to which all phases of national life have recently been subjected, have disappeared. Partly because of the difficulties just referred to, and more especially perhaps owing to the fact that the annual general meeting of the Society of Chemical Industry—on the occasion of which it has been the practice in the past for the Group to hold its principal annual conference—was this year held in Canada, the Group has organised evening meetings in place of the usual conferences. In spite of these circumstances, it is pleasing to record that the membership of the Group has been maintained at the satisfactory figure of just under 400, as against slightly over that figure at the close of 1920. The new committee elected in accordance with the rules, following upon the automatic retirement of a proportion of the original members, includes many other gentlemen of eminence in various fields of industrial activity, under the chairmanship, for a second year, of Mr. J. Arthur Reavell, M.I.M.E.

The relationship of the Group with the parent Society has formed the subject of many discussions during the past

year, and an agreement satisfactory to both parties has now been arrived at. Naturally, when an organisation like the Society of Chemical Industry undertakes so comprehensive a task as is represented by the work contemplated by the Chemical Engineering Group, a number of points of procedure, and so on, have to be settled after a certain amount of experience has been acquired of the working of the two bodies, and it is satisfactory to record that, following the first two years' work of the Group, an understanding has now been arrived at which will give the Group more support from the Society for its future work, and will bring the two bodies into closer harmony, to their mutual advantage. It must be recognised that the extension of the Group's membership necessitates an equal increase in the Society's membership, in virtue of the existing constitution, so that it is very much to the advantage of the Society to develop the scope of the Group to the fullest extent. The policy hitherto pursued by the Group Committee of holding meetings at frequent intervals in various provincial towns as well as in London, apart from its conferences, will, under the new arrangement, cement still closer the hitherto somewhat loose connexion between the various local sections of the Society and the Council and members in London. From another point of view, also, it must not be forgotten that a community of interest in a particular subject or a special phase of a subject is a closer bond of union between individuals than mere geographical propinquity can ever be. In other words, the Group system is, from one point of view, of distinctly greater advantage than the local section idea, although both have their undoubted uses.

In this connexion it is to be recorded that the Group has held during the year three meetings, two in the provinces and one in London. The first held during February in Huddersfield was extremely important in view of the subject treated, viz., "Plant for Treatment of Waste Waters," and aroused a vast amount of interest in the locality, where chemical engineering problems of this kind form a very important consideration for the textile manufacturer. The next meeting held in conjunction with the Manchester Section of the Society during November dealt with the subject of "Electrical Precipitation," an industrial process of ever increasing importance based upon an electrical phenomenon which was not very long ago simply a laboratory curiosity. The meeting, at which the writer was privileged to be present, was a most enthusiastic one, and augurs well for the success of similar meetings to be arranged under the same auspices. The last meeting arranged for the present year carried on the policy steadily followed by the Group, of joining forces with other scientific societies whenever problems of mutual interest were down for discussion. In this case the Institution of Mechanical Engineers collaborated with the Chemical Engineering Group in considering the question of the latest process for "Nitrogen Fixation," a matter which is of more than scientific importance.

For the immediate future the Group has in prospect a meeting jointly with the Glasgow Section, to be held in Glasgow towards the end of January, when Dr. W. R. Ormandy will deliver a paper on "Refrigeration." Dr. Ormandy and his collaborators have conducted many investigations into the technical aspect of this commercially important subject for many years past, and the paper to be read should be of unusual interest. Following that, the Group is joining forces with the London Section of the Society and the Smoke Abatement Committee at the Exhibition being organised by the latter during March, and here again there is no doubt but that extremely interesting contributions will be made to this vital subject, and most useful results will probably ensue. Later, in the middle of the coming year, a conference is being arranged during the annual general meeting of the Society of Chemical Industry in Glasgow, when the subject to be treated will be "Evaporation and Distillation." More details of this will be available later.

There has been some delay, partly owing to high cost of printing and partly due to lack of funds, in the publication of the second volume of "Proceedings" of the Group, but this is now on the point of being issued, and will be followed very shortly by the third volume. In addition, the Group has published during the year a further number of most excellent data sheets, and here again lack of funds has prevented more work being done than is in contemplation. It is pleasing to note that very determined efforts have been made to secure financial support for this important branch of the Group's activities, and, as a result, it is expected that an issue of these sheets will be made early in the coming year.

The financial position of the Group, never at any time very strong, is much more satisfactory than was the case at the corresponding period of last year. For the future prospects are extremely bright in view of the increased support now promised by the Society, although the volume of donations to the general funds of the Group is increasing rather than the reverse. This is an extremely healthy sign, and augurs well for the Group's influence and future progress.

A feature of the activities of some of the principal members of the Group Committee has excited comment in certain quarters, and that is their association with the proposal to form an Institution of Chemical Engineers. It is hardly necessary to point out that two bodies such as the Institution contemplated and the existing Chemical Engineering Group could work together in the closest harmony and be complementary, if not actually necessary, one to the other. The proposal of an Institution has already been referred to in the pages of this journal, and it is understood that the scheme is being pushed forward with vigour. Until the ideas expressed by the promoters take shape in more concrete form it is unwise to express any judgment as between the one organisation and the other, but there seems to be no reason why the view just expressed should not be borne out by actual experience.

Finally, it is very pleasing to look back upon the record of achievement so far accomplished, and to realise that, although very late in the day compared with similar organisations in other civilised countries, the Chemical Engineering Group has established its position in the world of technical societies, and should continue to increase in power and prestige as the scope of its work extends.

British Association of Chemists

In common with other professional organisations the British Association of Chemists has felt the stress of the severe industrial depression during the past year. Nevertheless, though its activities have been slightly restricted by the necessity of conserving sufficient financial resources, the Association has been able to accomplish much useful work.

Possibly the outstanding feature of the year has been the development of a scheme for an Unemployment Benefit Fund. A ballot on this scheme is now in progress, and should the verdict prove favourable the scheme may confidently be expected to come into operation early in 1922.

The Association has taken action in the interests of its members in a number of Parliamentary matters, such as the Development Committee set up under the Dyestuffs (Import Regulation) Act, the Safeguarding of Industries Act, &c. With the development of the Guild Organisation of the Association it may be expected that the intervention of the Association in such matters will become increasingly effective and beneficial both to its members and to the public.

The tentative negotiations with the National Association of Industrial Chemists produced no definite proposals for amalgamation on account of the difference in the standard of membership of the two bodies. A joint committee is at the present time actively investigating proposals for eventual amalgamation or closer co-operation between the B. A. C. and the National Union of Scientific Workers.

Effective assistance has been rendered by the Legal Aid Fund and the Appointments Bureau and numerous other matters, such as legal re-definition of the term "Chemist." Income Tax abatement for scientific men, technical education and service agreements, have received the continued attention of the Association. R. B.

The Chemical Industry Club

The Chemical Industry Club, which has now become the established social centre for chemical industry, has shown during the past year very healthy signs of increased life and usefulness. Notwithstanding the very serious state of chemical industry generally and of some sections of the profession in particular, the club has maintained its level of membership and is increasing in numbers. The Committee has very wisely begun to bring the club more prominently to the notice of the various societies, and it is now hoped that it will be indirectly the means of encouraging the development of similar organisations in the provinces. The club probably owes its success very largely to two facts, firstly, the obvious need for such an organisation and, secondly, its democratic institution. It would be easy to pick out certain gentlemen connected with the club, and to point to these as having done especially good work, but it is a feature of the club that this sort of thing is done as little as possible, and we therefore refrain.

With three years of active work at No. 2, Whitehall Court, and with the record that the club has paid its way and has never asked for a penny by way of donation from its guarantors, and with the general tone of goodwill and harmony among its members, there is no reason why the club should not be the forerunner of a bigger institution suiting the requirements of the trade and the profession even more adequately than the present club does. H. E. C.

The Faraday Society

THE Society has had an exceptionally busy session. Nine meetings have been held, and of these, four took the form of the general discussions which have been for long a feature of the work of the Society.

The discussion on "The Failure of Metals under Internal and Prolonged Stress," on April 6, was held jointly with six of the engineering societies, and was a good example of the value of bringing together specialists to review a subject from the most varied standpoints. A full report of the discussion has just been published. Another of the general discussions was on "Physico-chemical Problems relating to the Soil." This subject hitherto has not received a great deal of attention in this country, apart from the important work which is being carried out at Rothamsted by Dr. E. J. Russell and his staff, many of whom took part in the discussion. In the autumn the Society was fortunate to secure the presence of Professor J. Perrin and Dr. Irving Langmuir to take part in the discussion on "Catalysis with special reference to Newer Theories of Chemical Action." Earlier in the year the Society held a meeting at Manchester jointly with a local society at which the subject of "Capillarity" was discussed. At its ordinary meetings papers were presented dealing not only with theoretical aspects of physical chemistry but also on electrolysis and electrodeposition in their practical bearings, and they included an important paper by Mr. S. Field on the "Electrolytic Recovery of Zinc."

At the annual general meeting, held on December 13, the following officers and council were elected to serve for the forthcoming year :—

President.—Professor Alfred W. Porter, F.R.S.

Past-Presidents.—J. Swinburne, M.Inst.C.E., F.R.S., Sir R. T. Glazebrook, K.C.B., F.R.S., Sir Robert A. Hadfield, Bart., F.R.S.

Vice-Presidents.—W. R. Cooper, Professor C. H. Desch, Professor F. G. Donnan, C.B.E., F.R.S., Dr. J. A. Harker, F.R.S., E. Hatschek, Professor T. M. Lowry, C.B.E., F.R.S., Dr. G. Senter.

Treasurer.—Robert L. Mond.

Council.—Professor A. J. Allmand, Dr. H. Borns, Cosmo Johns, Professor J. R. Partington, C. C. Paterson, Dr. J. N. Pring, Professor W. C. McC. Lewis, Professor A. O. Rankine, Dr. E. K. Rideal, Sir Robert Robertson, K.B.E.

The annual report presented at the meeting stated that the work of the Society had greatly expanded, and an appeal was made for an increased membership, without which it would be difficult for the Society to keep pace with its increasing activities without raising the subscription. Up to the present this has been avoided. The office of the Society is at 10, Essex Street, Strand, London. F. S. S.

The Ceramic Society

THE Ceramic Society, founded in 1900 as "The North Staffordshire Ceramic Society," and continued from 1903 to 1916 as "The English Ceramic Society," can look back at the close of the year upon a period of useful and, indeed, indispensable activity. The papers read or communicated at the eight meetings held by the Society maintained the high standard of merit set in previous years—in itself no mean achievement.

On February 9, a joint meeting with the Art Section was held and was devoted mainly to a symposium on Art. Papers read (or communicated) at subsequent meetings include : "The Effect of Calcination of Flints on Earthenware Bodies "(A. Heath and A. Leese) ; "Industrial Fatigue" (Dr. A. S. Kent) ; "On the Porosity, Strength and Absorbing Power of certain Calcium Sulphate Cements" (A. B. Taylor and E. Irvine) ; "An Elutriation Test for Potters" (B. Moore) ; "Closed Circuit Grinding" (J. C. Farrant) ; "Notes on Tile-making at Sarreguemines" (F. S. Worthington) ; "A Tunnel Kiln in Czecho-Slovakia" (H. Barkby) ; "Transmission of Power by Ropes" (P. Kenyon) ; "Decomposition of Clay" (Dr. Mellor). In addition to the eight mentioned above, the Refractory Materials Section of the Society also held two meetings, the first, on May 14, being at Paris. Dr. Mellor communicated a paper "On the Plasticity of Clays," and other subjects included : "Pyrometer Installations in Works" (R. S. Whipple) ; "Notes on American Practice in Refractories" (W. J. Rees). In the evening, a reception and banquet were given in honour of the visitors by the Syndicat des Fabricants de Produits Céramique de France at the Hotel Palais d'Orsay. The subsequent few days were spent in visiting various French works and places of interest. The second meeting took place in London on October 6, when the following papers were read : "Refractory Materials of the London Basin" (H. Dewey) ; "The Marlow Gas-fired Tunnel Oven" (J. H. Marlow) ; "A New Type of Gas-fired Tunnel Oven" (P. J. Woolf) ; "Aluminothermic Corundum as a Refractory Material" (G. Granger) ; "The Reversible Expansion of Silica" (Professor J. W. Cobb and H. S. Houldsworth).

An auspicious event—namely, the coming-of-age of the Ceramic Society—was celebrated in a gratifying manner on December 6 by a dinner, at which the President, Lieut.-Col. C. W. Thomas, presided.

As evidence of the progressive spirit which pervades the Society, it may be mentioned that, commencing with the present session, the *Transactions* are to be published quarterly, instead of in two numbers per annum as hitherto. The collective index of the first twenty volumes of this journal is now in the press, and will be ready for distribution shortly. F. S.

Oil and Colour Chemists' Association

THE Association aims at assisting the development along scientific lines of the following group of allied industries :—The manufacture of pigments, paints, printing inks, linoleum, rubber and varnishes. According to the Report of the Council for 1920-21 the membership is steadily on the increase, and there are now over 200 members.

During 1921 papers were contributed by H. E. Clarke—"Evaluation of White Pigments, with Special Reference to Antimony Oxide" ; C. J. Seaman—"Grinding" ; J. N. Goldsmith—"Analysis by Refractometer" ; T. Hedley Barry—"Indian Products of Interest to the Paint and Varnish Industry" ; R. S. Morrell—"Presidential Address, with Special Reference to the Water-absorbing Properties of Varnishes and Paints" ; and A. E. Bawtree—"Theory and Practice in Colour Measuring and Recording." Professor J. M. Lowry opened a discussion on "Colour Measurement," in which Dr. Edridge Green, Miss Baker, and Messrs. Bawtree and Lawrance took part. A joint meeting has been arranged early next year with the Faraday Society for a discussion on the "Properties of Powders."

The Association is represented on a number of committees for the preparation of specifications for the protection of timber, light alloys and steel, as well as of dopes and chemicals for aircraft purposes, and the standardisation of chemical plant under the auspices of the British Engineering Standards Association and the War Office. The Association was represented at a conference of a deputation for the National Federation of Associated Paint, Colour and Varnish Manufacturers of the United Kingdom with the chief chemists of the railway companies respecting the transport of paints and varnishes. The Association has a member on the Research Committee on Colloid Chemistry and its General and Industrial Applications appointed by Section B. of the British Association for the Advancement of Science.

The officers for the year are :—President, Dr. R. S. Morrell, M.A., F.I.C. ; Vice-Presidents Dr. F. Mollwo Perkin, C.B.E., F.I.C., and Mr. S. K. Thornley ; Members of Council, Dr. J. N. Goldsmith, Messrs. W. G. Aston, S. G. Clifford A. de Waele, G. W. Dunster, A. Molteni, J. B. Shaw, and A. B. Warnes ; Hon. Editor, Dr. H. H. Morgan ; Hon. Sec. and Treasurer, H. A. Carwood. R. S. M.

Chemical Traders

THE two chemical traders' organisations—the Chemical and Dyestuff Traders' Association and the British Chemical Trade Association—have been busily engaged during the year in domestic negotiations between themselves and in efforts to safeguard the factor interest under such measures as the Dyestuffs and Safeguarding of Industries Acts. In the latter respect their influence has not materially modified the proposals laid before Parliament, but they have succeeded, as constituents of a joint vigilance committee of the London Chamber of Commerce, in successfully challenging the Board of Trade list. The controversy between themselves, of which the trade was becoming rather tired, has gradually died a natural death, and there is some prospect that at an early stage an agreement may be reached by which the resources of the two bodies will be united.

Bentonite: Supplies, Properties and Uses

By Raymond B. Ladoo

Some months since a visitor from Canada submitted to us a sample of a fine clay known as Bentonite and found in large quantities in British Columbia. The following notes by Mr. Ladoo, mineral technologist to the U.S.A. Bureau of Mines, deal with the sources of supply, chemical properties, and possible uses of this mineral.

THE name bentonite has been applied to a group or series of clay-like materials characterised by an alkaline oxide and alkaline earth content of 5 to 10 per cent. fine-grain size, high absorptive powers, and usually very strong colloidal properties.

Bentonite probably represents no mineral of fixed composition, and its physical properties vary considerably. The type material from Wyoming is light yellow or greenish-yellow in colour, but from other localities it may be cream-coloured, white, grey, pink, dark brown or even black. It is exceedingly fine grained, very plastic, and highly absorbent. The appearance may be dull or powdery, but a freshly-cut surface usually has a waxy lustre. Some varieties have the appearance of wax and may be cut into very thin, translucent shavings. The fracture of the type material is roughly conchoidal, that of other varieties is platey and shale-like, while still others have no typical fracture. Bentonite is highly absorbent; when wetted, it will absorb more than three times its weight or seven times its volume of water. Some varieties, when wetted with water, expand to more than six times (some experimenters report eight times) their original volume. The wetted material is exceedingly smooth and soft and feels like soft soap. Unlike most clays, bentonite is easily fusible at a comparatively low temperature.

Under a high-power miscroscope bentonite seems to consist of extremely small, more or less rounded, grains of uniform size, but the texture of most varieties is so fine that individual grains cannot be distinguished.

Some varieties, when finely ground and thoroughly agitated with water, will stay in suspension indefinitely, forming a translucent, gelatinous mass. The addition of small amounts of acids or sodium chloride seems to have little or no tendency to aid coagulation or settling. Other varieties of similar analysis and appearance go into suspension more easily, but settle out again in a comparatively short time. It has been suggested that the material which stays in suspension indefinitely is a true colloid of the emulsion or lyophilic type.

Chemical Properties

Some, and perhaps all, of the minerals of the bentonite group have the property of allowing easy replacement of the alkaline and earth oxides, one with another. This property has been utilized by at least one company for the softening of certain types of hard water. If hard water containing calcium sulphate be passed through a mass of bentonite containing sodium, the calcium sulphate is changed to sodium sulphate (soluble) and the sodium in the bentonite is replaced by calcium. The process is reversible and the bentonite may be rejuvenated by passing through it a solution of sodium chloride. The sodium is restored to the bentonite and the calcium is removed as a chloride. It is probable that carbonates are removable in the same way. This easy replacability of the alkaline oxides may have an important bearing upon the physical properties of the bentonites. For example, it is possible that the differences in colloidal properties of various bentonites may be due to the variation in the relative percentages of the alkaline oxides.

Sources of Supply

Wyoming.—In Wyoming, bentonite occurs in the lower Benton formation of Cretaceous Age in many parts of the State, but the most important localities have been found to be in the Laramie and Big Horn Basins. It occurs in beds varying in thickness from a few inches to more than 5 ft., usually both overlain and underlain by a shale of very dark colour. The beds usually lie nearly flat, and are exposed over wide areas. The commercial deposits are covered by only a few inches of weathered material, so that very little stripping is required. Rough joints perpendicular to the bedding permit the material to be broken down easily. The clay is removed by hand, shovelled into waggons, and hauled to the nearest railroad siding, where it is loaded into box cars without further preparation. Some of the Wyoming bentonite is shipped to Chicago for grinding. The principal producers in Wyoming are at Rock River, Newcastle, Cheyenne and Medicine Bow.

California.—In California many deposits of bentonite have been reported, and at least one has been worked. In San Bernardino County, between Barstow and Daggett, a deposit of excellent, white, highly colloidal material has been opened by underground methods. The product is shipped to Los Angeles, where it is ground, sized by air separation and bagged for shipment. Near Otay, San Diego County, are found deposits of an exceedingly, fine-grained waxy material, white or pink in colour, resembling the typical bentonite in composition grain size, feel, &c., but lacking the property of staying in suspension indefinitely. Experiments have been made with this material as a substitute for fuller's earth in oil refining.

South Dakota.—At Ardmore, South Dakota, the Pierre shales contain strata of a gray, fine-grained, clay-like material in nearly horizontal beds 6 in. to 3 ft. thick. This material was originally known as bentonite, but as it differed somewhat from the Wyoming bentonite the name "ardmorite" has been applied to it. The principal difference seems to be that it will not stay in suspension indefinitely. The beds are overlain by 2 to 6 ft. of black soil, and usually underlain by thin bedded black shales. In mining, the surface material is stripped off with a steam shovel. The beds of ardmorite are then drilled by hand, blasted with dynamite, and the loosened material shovelled into motor trucks which transport it to the mill at the railroad. This material is used for the manufacture of a water softener, and the milling process is more complicated than is common in most bentonite treatment.

The following description of the process was furnished by the company. The raw material is first allowed to age and weather in stock piles in the open air. From the stock piles the material is placed in thin layers on steam coils, where it dries and partly disintegrates. From the steam coils it goes to a hammer mill for coarse crushing, then to screens to remove impurities, thence to disintegrators. From the disintegrators it is conveyed to a pug mill where it is mixed with water and kneaded. The plastic clay is then fed to an extrusion press, where it is forced out through a die in small strings, $\frac{1}{16}$ in. to $\frac{1}{8}$ in. in diameter, resembling needles. The strings of clay are placed in wire-bottom trays, racked on cars and slowly passed through a continuous, steam-heated drying tunnel. The dried strings are sent to a hammer mill and thence to a screen, to remove the fines, which are sent back for reprocessing. The product then passes through a 6 ft. by 60 ft. oil-fired, rotary kiln, where it is baked at a high temperature. The baked material is then rehydrated, with a hydrating solution, in large steel vats heated by steam coils. The rehydrated material is washed with water in cylindrical wooden towers, 3 ft. in diameter by 12 ft. high, again screened to remove fines, drained and either packed in barrels or put in storage vats.

At Belle Fourche, South Dakota, is found a yellow, fine-grained, exceedingly plastic bentonite, closely resembling the Wyoming material, especially when wetted. In suspension in water it forms the peculiar jelly-like mass common to the Wyoming bentonite.

Other States.—Deposits of bentonite have been reported at various localities in Montana, Arizona, Utah, Texas and Tennessee. Near Declo, Idaho, is found a very dark-brown material closely resembling the Wyoming bentonite in every way except in colour. The dark-brown colour is apparently not due to organic material. This clay forms the characteristic gelatinous suspension.

In New Mexico, about 35 miles north of Santa Fé, near the Denver and Rio Grande Railroad, are deposits of bentonite 3 ft. to 5 ft. thick. This material is of a pink or flesh colour, and has a waxy lustre. It disintegrates rapidly in water to a soapy, flocculent mass, but it does not stay in suspension.

Canada.—A deposit of bentonite about 9 ft. thick has been reported at Merritt, British Columbia. It is also stated that other deposits are known in the Nicola and Similkameen mining divisions of British Columbia.

Production and Prices

Considering the unusual physical and chemical properties of bentonite, production has been remarkably small. From 1888 to 1895 the production averaged 60 tons per year, valued at about $25 per ton f.o.b. cars. In 1902 the production rose to 1,200 tons, but the price dropped to $5, later rising to $6 or $7 per ton. In 1919, the Wyoming production was at the rate of about twenty-five cars per year, valued at $7 per ton. During 1920 and 1921, interest in bentonite greatly increased, new deposits were opened, and it is expected that the production will expand more or less rapidly. It is reported that powdered bentonite from Wyoming and California would sell in eastern markets at $25 to $30 per ton in car lots.

Industrial Uses

Until very recently the uses for bentonite were few and relatively unimportant. These seem to have been principally in the manufacture of the medical dressing, antiphlogistine; in the manufacture of a packing and dressing for horses' hoofs; as a retarder in the manufacture of gypsum wall plaster; as a filler in the manufacture of paper (at a mill in Denver); as a filler in soap; as an adulterant in drugs and candies.

Within the last few years, the unusual properties of bentonite have attracted considerable scientific attention, and systematic research has been undertaken to study this material, and to develop the best methods for its utilisation. The Forest Products Laboratory, of the Department of Agriculture, Madison, Wisconsin, has made rather exhaustive tests on the use in paper-making of a high-grade variety of light yellow, colloidal, Wyoming bentonite, known as Wilkinite. Their tests seem to show that the addition of small amounts of bentonite to the clay used as a paper filler greatly increases the percentage of filler retention in the finished product. Thus, in one test, the retention with clay alone was 45 per cent.; with 10 per cent. bentonite and 90 per cent. clay, 58 per cent.; with 20 per cent. bentonite and 80 per cent. clay, 64 per cent.; and with 100 per cent. bentonite, 84 per cent. Some paper companies that have tried out this material claim the additional advantages of complete suspension in water and the production of a paper of superior "feel." Other paper companies admit some of the advantages of using bentonite, but object to the yellow colour of the Wyoming material and submit that the advantages are not sufficient to warrant the increased cost involved. It is reported that the Forest Products Laboratory is also experimenting on the use of bentonite for de-inking news print. Bentonite seems to absorb all the ink without affecting the pulp.

In the manufacture of soap it has been proved that some bentonites can actually replace 25 to 50 per cent. of the soap substance, producing a soap equal or superior to the ordinary soap. It should be noted that bentonite is not used in soap as an adulterant or scouring agent, but actually replaces part of the soap substance and increases the lathering and detergent properties.

Owing to the extremely fine grain size of bentonite, the suggestion has been made that it would be suitable as a filler for rubber. It might also be used as a filler for phonograph records, textiles, cordage, pressed and moulded electrical insulation, &c. It seems to have interesting possibilities in the manufacture of paint.

As an ingredient in gypsum and lime plasters, bentonite should add plasticity, but it would probably increase the drying shrinkage. Its high plasticity suggests its possible application in ceramics, thus enabling smaller quantities of bonding clay to be used; and the possibility of replacing the bonding clay used in electrical and chemical porcelain, abrasive wheels and graphite crucibles with bentonite is being considered.

It is reported that some bentonites make superior adhesive paste, particularly for sticking paper to metal. It is claimed that labels pasted on iron with bentonite will not curl up and drop off.

The great affinity of bentonite for water has suggested the possibility of devising a method for using it to de-water crude petroleum.

The use of material of the general nature of bentonite as a water softener has been partly described above. It is not definitely known whether all bentonites possess the property of softening water, but the usual presence of the alkaline oxides suggests this possibility. If this property is common to all varieties it is probable that other uses based thereon may be devised.

Other uses suggested for bentonite are as a base for massage creams, a base for the precipitation of lake colours, a base for printers' ink, as a heavy lubricant or grease (mixed with oil), and as a filler or dressing for leather.

Analyses of Bentonite

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
SiO_2 ...	60·64	57·98	58·68	59·84	60·18	63·20	54·00	55·22
Al_2O_3 .	23·26	22·46	25·91	11·84	26·58	12·90	24·48	21·00
Fe_2O_3 ..	3·92	3·80	3·97	3·26	—	2·46	3·00	3·61
TiO_2 ..	0·12	—	0	—	—	0·11	—	—
CaO ..	0·59	1·92	1·45	2·90	0·23	0·82	2·08	4·94
MgO ..	2·19	3·24	1·49	2·23	1·01	2·09	2·75	3·04
K_2O ..	0·37	1·35	0	2·43	1·23	0·26	—	—
Na_2O ..	4·33		1·39	2·13		0·66	1·74	1·56
SO_3 ...	—	0·75	0·11					0·43
CO_2 ...	—	—	tr.			3·50*		tr.
Cl			0·10			0·20†		0
P_2O_5 ..			0·06				0·71	—
Ign. Loss		7·93		10·50				
H_2O. ...	2·83		6·84		10·26	13·80	9·12	10·28
Total..	98·25	99·43	100·00	95·13	99·49	100·00	97·88	100·08

* Sand, &c. † Water soluble.

No. 1. Yellow, colloidal; Belle Fourche, South Dakota. Analyst, W. A. Selvig, U.S. Bureau of Mines.

No. 2. Yellow, colloidal; Medicine Bow, Wyoming. Analyst, A. G. Van Eman, Owyhee Chemical Products Co., Chicago, Ill.

No. 3. White, colloidal; near Barstow, California. Analysis from California Master Products Co., Los Angeles, California.

No. 4. White, fine grained; Otay, San Diego County, California. Analysis from Otaylite Products Co., Los Angeles, California.

No. 5. Type material from near Rock Creek, Laramie Basin, Wyoming. Analyst, T. T. Read, Cassa Mining Co.

No. 6. From Big Horn Basin, Wyoming. Analyst, R. C. Wells, U.S. Geological Survey.

No. 7. Supposed bentonite, near Shelbyville, Tenn. Analyst unknown.

No. 8. "Ardmorite," probably variety of bentonite; Ardmore, South Dakota. Analysis from the Refinite Co., Omaha, Nebraska.

Waterproofing Textile Fabrics

The New Electrolytic Process

A FURTHER important and interesting application of electricity in the field of industry is the new electrolytic method of waterproofing fabrics, constituting a considerable improvement on the older methods. These older methods have been either mechanical or chemical. The purely mechanical processes are now little used, as they did not provide for proper ventilation, which is so essential in waterproofed garments, both on hygienic and comfort grounds. They consisted merely in impregnating the fabric with various filling materials such as rubber, waxes and various compounds which had the effect of completely excluding the air. The chemical processes are based on the deposition of waterproofing material by means of chemical reaction, and are mainly of three kinds: (1) The ammonium cuprate method, (2) the lanolin method, and (3) the aluminium soap method. The last-named is the one most frequently employed where good ventilation is wanted, *e.g.*, for raincoats, &c. The fabric is first soaked in a rather highly concentrated soap solution and then passed through a solution of aluminium salts, namely, alum, aluminium sulphate or aluminium acetate. Chemical reaction takes place between the soap of the first solution and the aluminium salt in the second solution, and consequently aluminium soap is formed and deposited on the fibres of the fabric. When fresh this coating of aluminium soap is highly elastic, adhesive, and waterproof, but these qualities only last for a short time. In a few weeks it becomes dry and friable and gradually crumbles away from the fabric. The aluminium soap is also dissolved in processes of dry-cleaning with benzine or petrol, and is thus entirely removed.

Numerous attempts have been made to evolve an electrical method of impregnating fabrics, based on electrolysis. The most interesting of these were by H. L. Brevoort (U.S. Pat. 558,717) and J. T. van Gestel's patent. Van Gestel first of all attempted to discover a better way of working Brevoort's process on a large manufacturing scale, and afterwards to

devise a method of his own, but in neither case was he successful to the extent of finding a suitable method.

The Tate Electrolytic Process

In the Tate electrolytic process, which has been recently described by Dr. H. J. M. Creighton, in the *Journal* of the Franklin Institute, the fabric is not only coated with a water-repelling substance, but it is claimed that the inner capillary system of the fabric is entirely filled with this substance, that is to say the spaces in between the fibres. The new process was first installed on a commercial basis in the autumn of 1916, in Montreal, where it was operated during the war by an Imperial Commission, and subsequently in New York City. In July, 1920, the New York plant was transferred to Cranston, Rhode Island, where an additional equipment has been installed to provide a maximum capacity of about 30,000,000 yards per annum of electrolytically waterproofed and electrically converted fabrics.

Briefly this process consists in passing the fabric, previously saturated with a sodium soap solution, between a graphite cathode—over which flows a solution of aluminium acetate—and an aluminium anode which is completely enveloped in a heavy woollen pad. This pad is an important and distinctive feature of the invention, and ensures a regular and uniform degree of waterproofing throughout the fabric. The history of the development of the Tate process into its present improved form may be divided into four periods. In the original type of machine the fabric was simply passed between pairs of rollers, the negative roll consisting of graphite, with electric contact through a collector brush at one end, while the positive roll consisted of a metal spider on which was spirally wrapped an aluminium drawn bar 1 sq. in. in section. Owing to the length of time required for thorough impregnation and the fact that the rollers had only a very small area of contact the output of the machine was very low, being limited to about 34 in. per minute. A considerable improvement was made in the second stage of development, in which one of the roller electrodes was replaced by a stationary-sector electrode, with a length of contact of about 5 in. In this improved type of machine the fabric was drawn between the one roller and the sector at a speed of about 5 yards per minute, and although the speed was thus much greater the results obtained were quite as satisfactory as with the earlier type of machine. In the third stage both rollers were dispensed with, and the material to be treated was drawn between flat plate electrodes of aluminium and graphite, contact between the fabric and the electrodes being maintained by adjustable spring pressure. The rate of output was now further increased to 27 yards per minute, that is, thirty times as great as that of the first machine. The most serious difficulties to be dealt with now were the seams in fabrics, and since no provision had been made so far for relaxing the pressure when sewn lengths of fabric passed through, the machine had to be stopped and the upper electrode lifted to permit of the passage of the seam, otherwise the fabric would be torn. A means of getting over this difficulty was soon devised, and the fourth stage of development was reached when the graphite bars of the cathode were so arranged that when a seam was encountered each graphite bar in turn moved backward and upward, and after the seam had passed fell back automatically into its original position. The electrodes were now placed vertical, the anode consisting of an aluminium plate 1 in. thick, 18 in. wide, and 60 in. to 72 in. long, and the cathode of eight granite bars 1½ in. thick by 2 in. wide and the same length as the anode. These graphite bars are spaced ¼ in. apart, and their ends fit loosely between metal guides which are inclined toward the anode, thus permitting of the necessary automatic movement.

Newest Method Described

In working the newest type of machine for carrying out the electrolytic process the following procedure is adopted: Woollens are thoroughly washed with soap and rinsed in water at a temperature of about 150°F. to remove any excess of wool grease or soap that may have been left in when the fabric was made. Most of the wool grease will have been removed from the original raw wool before it is made up into fabric, and since considerable improvements have recently been made in this wool-degreasing process the preliminary washing of the fabric can sometimes be dispensed with, although this is not advisable. Cottons are all de-starched by washing in a similar manner and thus freed from all foreign matter. The fabric is then passed into the waterproofing machine, where it is saturated in a thin solution of soap (sodium oleate), and from these soap baths it travels up over a brass idler roll, and downwards between the electrodes, between which a current of 30 to 60 ampères flows, the current density depending upon the nature of the fabric and the amount of proofing required. From troughs connected with a suitable supply system the aluminium acetate solution is fed between each of the ¼-in. opening separating the graphite segments of the cathode. On coming into contact with the soap (sodium oleate) in the fabric a chemical reaction takes place resulting in the formation of an insoluble aluminium oleate (aluminium soap) on the surface of the fabric. A thorough and even distribution of the aluminium acetate is effected by means of a number of ducts on the contact face of each graphite segment. When the woollen pad covering the anode first goes into action it is saturated with water, but during any given period of operation no further use of water is necessary, as it then works through the saturated fabric. The other compound formed during the chemical reaction just noted, namely, aluminium hydroxide, is forced into the interstices of the fabric owing to the electrical attraction between the hydroxide and the cathode. After passing between the electrodes the fabric travels through a water bath and thoroughly washed, thence through squeeze rollers to a second oleate bath and through a continuation of the process just described, except that the electrodes and their action are now reversed. Cotton goods are usually subjected to four treatments or two reversals, whilst with silks and woollens two treatments or one reversal are sufficient.

Fabrics thus treated have been subjected to severe tests and have shown remarkable water-resisting qualities, and in addition to this they are proof against mildew.

Review

THE DISTRIBUTION OF GAS. By WALTER HOLE. Fourth Edition. London: Benn Brothers, Ltd. Pp. xv., 699. 50s. net.

There are two volumes—namely, "Modern Gasworks Practice" and "The Distribution of Gas"—which are now looked upon as providing the standard literature of the gas industry, and if their monumental nature is indicative of the ramifications of the subject then the average layman may derive comfort from the fact that he did not choose gas engineering as a profession. On the other hand, we whose walk in life has led us into the highways and byways of manufacturing and distributing so essential a commodity as town's gas must feel that we owe no mean debt of gratitude to the authors of the above works who, in a spirit of altruism, must have burned far more midnight oil than was good for them. It is, in fact, difficult to find words with which adequately to describe these volumes.

Perhaps, in contrasting the gas industry with the chemical industry, the point which stands out above all others is that the technical literature of the former has been collated in a far more accessible manner than has that of the latter. A gas engineer, for instance, knows that he can find all that he requires in one or other of two volumes, whereas the chemist frequently has to consult a dozen or more authorities on one branch of his science—a complicated state of affairs when all such authorities are found to be in disagreement on some particular problem. There is a great deal to be said for the segregation of information, and one cannot withhold a word of praise for publishers who are sufficiently enterprising to appreciate that those who want information do not study the cost of it so long as it is reliable and comprehensive. Those gas engineers who are looking for a secure and profitable investment will be rewarded with an ample return on their outlay if they acquire Mr. Hole's book. It is not without its minor deficiencies and omissions, but so far as the subject it deals with is concerned, it has no competitor and is not likely to have.

The technique of gas engineering is quite sharply divided into two distinct categories. There is the procedure—a complicated intermixture of civil, mechanical, and chemical engineering—which is solely confined within the boundaries of the gasworks, whereas there is the more straightforward work of distributing the gas to every conceivable area of that portion of the surrounding district which is, or may in the future be, inhabited. This does not mean that the "outside" gas engineer is mainly concerned with laying pipes and making connexions. In addition to being a universal provider of and expert on every conceivable device for supplying light,

heat, or power, he frequently has to play the *rôle* of family adviser, while his gifts of persuasiveness may be put to a severe test when a customer shows signs of defecting to the electrical camp. Fortunately the feud between gas and electricity purveyors is obsolescent. Each undertaking realises that it has its respective ground to cover, that there is ample room for both, and that co-operation when possible is a far saner policy than contumely. The stimulating influence of the old rivalry has, however, borne good fruit. If there had been no electrical undertakings, then probably there would have been no Mr. Hole's book, for there would have been no necessity for the district staff of gas undertakings to acquaint themselves with the variety and intricacy of gas-consuming appliances, and no need for them to prime themselves with Mr. Hole's facts as to why gas in every instance provides the more effective and economic commodity.

So far as the fourth edition compares with its predecessor one is struck mainly by the fact that considerable amplification has taken place. When the third edition appeared the gas industry was labouring under the burden of archaic official standards of quality, and the suggestion that a medium-grade gas probably gives the best service had not even been propounded. The Gas Regulation Act of 1920 has, perhaps, had more influence on manufacturing rather than on distributing practice, but considerable developments have occurred in the design of appliances to give a maximum of thermal efficiency whether a high or medium grade product is consumed. All these things have given the author an opportunity which he has used to the full, but one could have wished to have found more about that aggravated question of flame temperature, its relation to various gas consistencies, and whether the author could advance further proof or disproof as regards the modern catch-phrase that "one B.Th.U. is as good as another whatever company it keeps." Another point which strikes the reader is that although intrinsic illuminating power is a property of little account nowadays it cannot be entirely neglected, for in many instances such as in engineering shops, the flat-flame burner is still by far the most adaptable form of lighting. It is, however, an error of judgment rather than a serious omission for no reference to be made to the peculiar instances where the "fish-tail" or similar burner may still be conveniently used.

In conclusion it must be said that the material which Mr. Hole has collated, interwoven as it is with practical suggestions born of his own long experience, is indispensable to all associated with gas undertakings, and, moreover, it could be studied with profit by all who consume gas in quantity. A. G. E.

The Late Mr. Henry Oertling

All who knew him personally, and many who knew him only by his work, will regret to hear of the passing of Henry Rowlatt Augustus Oertling, the only son of the late Mr. L. Oertling, the well-known balance and scientific instrument maker. He was born in London in 1848, and was educated at the University College, and after leaving school he was trained in his father's workshops in the art and craft of instrument making. There he was taught by a master hand to use that meticulous care and precision necessary for the production of a perfect balance. Well he carried out the traditions so carefully instilled into him, and until he was stricken by the illness which finally caused his death on December 19 last he made it a practice personally to inspect and finally adjust all his best products, as his father had done before him.

Henry Oertling was married twice—first to Miss Emily Upton, by whom he had a daughter and a son, and secondly to Miss Loddiges, by whom he had two daughters. His wife and daughters survive him, but his only son, who had been trained to take his place in his father's business, like most other young men of his age, joined up and served his country in the Great War, last of all as a captain in the R.A.F., to which he had been transferred. Unfortunately he was killed on August 8, 1918. His death was undoubtedly the cause of his father's last illness, a stroke from which he never recovered, though he continued to carry on up to the last.

In 1907 Mr. Oertling's eldest daughter married Mr. Malcolm Dunbar, who was then appointed his father-in-law's confidential assistant, and when the business in 1919 was converted into a private limited company he became a director and the secretary of it. He now takes on the duties of managing director of Oertling, Ltd., officially, although he has actually been doing this work for the last two years. F. H. N.

The Scouring of Cotton Fabrics

Boiling and Bleaching Tests Described

At a meeting of the Manchester Section of the Society of Dyers and Colourists, held on December 16, Professor E. Knecht presiding, a paper was read by Mr. J. Huebner, M.Sc.Tech., F.I.C., upon the effect of scouring and bleaching upon the structure and the strength of cotton fabrics.

Mr. Huebner discussed the results of a large number of tests carried out to ascertain the effect of different methods of boiling and of bleaching upon the tensile strain, the elongation, the ripping strain and other properties of cotton fabrics. He dealt with a process of scouring which, he said, produced freedom of the scoured fabric from fats, starches, and other sizing ingredients, with the least reduction in strength; he also described the changes in the structure of fabrics which took place during scouring.

The effect of scouring on the tensile strain and on the elongation was discussed, and it was shown that the loss in tensile strain of a carefully-scoured fabric was not very serious, and that the comparison of the mean tensile strain with the weight of the fabric showed that the mean ratio of the breaking strain of the grey fabric to that of the scoured fabric was less than the ratio of the weight per square metre of grey to that of the scoured fabric.

The author then dealt with the results of tests carried out in order to ascertain the effect of each operation through which the fabrics passed in scouring and bleaching. While the first part of the investigation dealt with a scour in which the fabrics were boiled with a mixture of caustic soda and soda ash, and with soda ash alone, it had been extended, in the second part, to boiling with lime and with soda ash, to boiling with caustic soda, and soda ash, and to bleaching. It was shown that, as a rule, chemicking actually increased the tensile strain of the fabrics, and that whatever loss occurred was due to the boiling with the different alkaline liquors. As in the case of scouring, careful bleaching did not unduly reduce the tensile strain of fabrics. It was shown that the effect of scouring on the ripping strain of the fabrics was very similar to that on the tensile strain, but that the effect of bleaching on the ripping strain was much more pronounced. It was also pointed out that the changes produced by the caustic soda boil were in every case more pronounced than those which resulted from other methods of boiling.

Mr. Huebner said that while the testing of fabrics for strength was of interest to the user, it was of greater importance to the spinner, the manufacturer, the dyer, the calico printer and the finisher, and that only by testing fabrics before and after each of the different operations could we expect to obtain information which might ultimately lead to improvements in the structure of yarns and fabrics, as well as in the mechanical and chemical processes through which they had to pass.

A discussion followed, in which Messrs. Knecht, Harrison, Higgins, Hannay, Lowe and Thomson took part.

Food and Drugs Analysis

An extract from the annual report of the Ministry of Health shows that during 1920 111,797 samples were purchased for analysis under the Food and Drugs Act, of which 7,903 were reported as not being genuine. In 1919 the number of samples submitted was 101,140, of which 8,313 were reported as not genuine. In regard to vinegar, 190 samples out of 2,346 were reported against. Various forms of adulteration were practised, including the use of coloured and diluted acetic acid, the addition of water, and the substitution of non-malt for malt vinegar. In regard to fruit cordials, a few cases had been noted of the sale under the name of various popular fruit beverages, such as lemon squash or lime-juice cordial, of solutions of phosphoric acid, with the addition of sugar and various flavouring and colouring substances. One sample of lemon squash was found to contain 13.1 grains of salicylic acid per pint and 1.20 per cent. of phosphoric acid. Of 5,353 samples of drugs, 453 were reported against. The number of samples of borax submitted was 182, of which 56 were reported not to be genuine. In most cases small quantities of arsenic were found. Two samples were found to contain 50 parts of arsenic per million. Of 425 samples of cream of tartar analysed during the year, 32 were reported against. In a few cases traces of lead or arsenic were found, whilst other samples (sold as substitutes) showed excessive proportions of calcium sulphate. One dealer who was asked for cream of tartar supplied an inspector with a mixture of the acid phosphate of sodium and 12 per cent. of maize starch.

Alby United Carbide Factories

Prospect of Reconstruction

AN extraordinary general meeting of the Alby United Carbide Factories, Ltd., was held on December 22 at Winchester House, London, E.C., for the purpose of considering a resolution for the liquidation of the company.

Colonel O. C. Armstrong, D.S.O., who presided, said that on the very eve of the meeting certain issues had arisen which might modify the conditions which existed when it was decided to call the meeting. He referred to the situation which arose owing to the breakdown of certain negotiations, which, if they had been successfully concluded, would have relieved the company of an indebtedness of approximately £400,000. Mr. Helliesen, one of the Norwegian directors who had recently arrived in this country, had reported that in discussions and interviews which he had had with responsible Government officials they had expressed a strong hope that it might even now be possible to defer putting the company into liquidation, with a view to ascertaining whether some further alternative means could not still be found to avoid resort being had to such a drastic step. In support of this he further stated that one of the company's largest creditors in Norway, the Bergsen Privatbank, though they were practically fully secured, had gone so far as to press him strongly to support the Government views in all discussions with his colleagues. It also appeared, continued Colonel Armstrong, that some of the parties with whom they were recently negotiating would not be averse to the acceptance of these views. In face of these new factors the board felt that the meeting should be adjourned, and so give them the opportunity of a closer examination of the exact trend and value of the wishes hinted at by the several parties. Their information was of necessity vague and devoid of detail, and it was only right to refer to the possibility of future negotiations, if initiated, again proving abortive. In spite of this, he thought the shareholders had nothing to lose by awaiting the result of further discussions. The directors had just received telegraphic assurance that it was the intention of the Tyssefaldene Power Co.—which has a lien on buildings and plant of the carbide factory as security for due payment of power rent—to stay all further proceedings for foreclosing on the company's property in Norway until some time subsequent to the end of January next.

After some discussion, it was unanimously agreed to adjourn the meeting to a date, not later than February 28 next, to be fixed by the board.

According to the balance sheet at December 31, 1920, issued recently, the total debit balance on profit and loss accounts of the whole group amounted on that date to about £500,000, and almost every asset was pledged to creditors. The liabilities of the company for loans from bankers, &c., amounted to £693,613, not including guarantees. These, as well as other liabilities, the report states, have since been reduced by the sale of the shares in the St. Helen's Colliery and Brickworks Co., as well as certain other assets. In view of adverse conditions in Norway stringent steps were taken early this year to reduce expenditure. The cyanamide factory had already been closed down in December last, as large stocks of fertilisers were on hand, and the state of the market did not warrant further production. In view of the restricted market for carbide and the impossibility of obtaining coal, the carbide factory was closed down in the following May. The electrode factory at Hebburn is in the hands of a receiver appointed by the Treasury, and the nitric acid factory at Dagenham has been closed.

Work of the Sulphide Corporation

Results of the Edmunds' Award

IN his speech at the twenty-fifth annual meeting of the Sulphide Corporation, Ltd., held on December 22, at Winchester House, Old Broad Street, London, E.C., the chairman (the Earl of Kintore) said that a year ago work had been recommenced at Broken Hill under the new conditions created by the award of Mr. Justice Edmunds. Under that award it was inevitable that costs would be increased and production reduced, owing to the reduction of the hours of working and the increased scale of wages. Whether there would be any profit left for the companies depended upon the future prices for lead and silver. At the old pre-war value the new conditions would be hopelessly uncommercial, and the future of the Broken Hill industry was left dependent on the extent to which the increased costs would be offset by increased prices. The resumption of work at the end of last year was by no means general, and their company was the only one to work on full scale, so they could see pretty closely what the new conditions meant. In quantity their output of crude ore had been reduced by nearly half, and the cost of production had more than doubled. That meant that with lead at £20 per ton and silver at 3s. an ounce, none of the Broken Hill mines working on crude ore alone could make profits, and if those metals were to fall back to the prices which ruled before the war, a stoppage of the whole industry would be inevitable. Such a condition of things could not be favourable to labour any more than it was to capital.

The restriction of output, he continued, was not only bad for the mines, but bad for Australia, which needed all the exports she could muster to keep the balance of trade in her favour. In this country labour was beginning to recognise that reduced wages were better than unemployment, and that no more could be got out of an industry than the industry could afford to pay. What the situation required was a modification in the conditions.

The company's total output of crude ore amounted to 62,419 tons. The effect of the epidemic of strikes which had prevailed in Australia with increasing intensity since 1915 had been to reduce their tonnage raised and treated from 200,000 tons per annum in normal years before the war to the present figure. Their English zinc works had had a most difficult and unsatisfactory year, and, owing to the present conditions, all zinc works in England were at the moment closed down. However, under an arrangement with the Board of Trade for the supply of Australian zinc concentrates, their works and practically all the other English works would shortly resume operations on a basis which gave them hope of successful working.

Effect of Solders on Beta Brasses

READING a paper on the above subject at a meeting of the Sheffield Association of Metallurgists and Metallurgical Chemists, at the Royal Victoria Hotel, Sheffield, on December 20, Mr. J. H. S. Dickenson described an investigation into the failure of Manganese bronze, or Beta brass forging, which, fractured, showed characteristics resembling those of over-heated or burnt alloy steels. This failure was ultimately shown to be due to the action of ordinary solder on the brass when in a heated condition. A systematic investigation was undertaken to ascertain the effect of various types of solder, some of their low melting points, on different types of brass, and it was found that a weakening effect was produced in every case. The effect was, however, much more strongly marked with Beta brass, having a simple polyhedral structure, than on Alpha brass, having well interlocked crystals. It was further found that the solders penetrated between the crystalline grains of the brass when this was under stress, tending to tear the grains apart, but did not penetrate when they were pressed together in compression. It was suggested that the weakening effect of solder was due to the extreme readiness of the under-cooled vitreous cement between the crystalline grains to combine with the coating alloy. This phenomena was found to present a close analogy to the action of mercuric salts on brass, which had been extensively used in the testing of cartridge cases. The great practical importance of this work was strongly emphasised, it being shown that large and complicated machinery was liable to sudden and disastrous failure if it included manganese bronze parts liable to be brought in contact with fluid solder.

Tenders Invited for Creosote

THE Municipal Council of Johannesburg invites tenders for the supply and delivery of 45 tons of creosote in steel drums (Contract 849). Tenders on the proper form, and accompanied by a certified cheque as deposit for 10 per cent. of the total amount (limit of such cheque £100), must be addressed under sealed cover to the Town Clerk, and placed in the tender box at the Municipal Offices, Johannesburg, not later than noon on January 25 next. It is improbable that contracts with public bodies in the Union of South Africa will be secured unless United Kingdom firms are represented by an agent resident in the Union. The Department of Overseas Trade is prepared to assist United Kingdom firms in the appointment of suitable agents. The specification, conditions, &c., attached to the above contract may be seen by firms interested on application to the Department of Overseas Trade (Room 84), 35, Old Queen Street, Westminster, S.W. 1. Reference No. 7,497 ED/P.N. should be mentioned.

Oxides of Nitrogen

A New Method of Determination

In Technical Paper 249, "The Determination of Oxides of Nitrogen," by A. C. Allison, W. L. Parker and G. W. Jones, just issued by the United States Bureau of Mines, a new method for the determination of this noxious gas, sometimes formed after blasting in metal mines, is described.

The Bureau of Mines, in the course of its work towards the minimising of accidents in mining operations, has occasion to make analyses of gases in determining the ventilation conditions and the hazards that may develop from exposure of the workers to gases liberated in mines. In metal mines, where much blasting is done, the shots are often prepared improperly, and some oxides of nitrogen may be formed after firing. Moreover, other industries than mining produce oxides of nitrogen, which have a deleterious effect on individuals breathing them for any length of time.

Two gases that result from the firing of explosives are, because of their physiological effects, important in mine ventilation. They are carbon monoxide and oxides of nitrogen. Other gases produced at the same time, including carbon dioxide, hydrogen, methane, and nitrogen are unimportant unless in proportions sufficient to diminish appreciably the oxygen content of the mine air. Carbon monoxide and oxides of nitrogen usually occur together and are very harmful even when inhaled in small quantities. About 0.01 or 0.02 per cent. is the maximum quantity of carbon monoxide allowable continuously in mine air without affecting the workmen harmfully, although as much as 0.04 per cent. is harmless for periods of time not exceeding one hour. Very little data is available on the maximum quantity of oxides of nitrogen that may be tolerated in mine air without danger to the men working therein. The general conclusions are that 0.01 and 0.02 per cent. of oxides of nitrogen is dangerous, and under no conditions should 0.05 per cent. be reached. Carbon monoxide can be determined to an accuracy of about 0.02 per cent. by the usual Haldane analysis, but an accurate method of determining oxides of nitrogen at low concentrations has heretofore been impossible without using a large quantity of gas for a sample.

A method was desired by which very small quantities of oxides of nitrogen could be determined from a minimum quantity of gas, for samples of mine gases are taken most conveniently in vacuum bottles of about 250 c.c. capacity. The nitron method used by Gutbier and Busch is difficult to perform, and cannot be used at such low concentrations as are present in the usual mine-air samples. To be of value in mine-gas analysis, a method should be accurate to at least 10 parts per million, or 0.001 per cent. After explosives have been fired, especially in ventilated working faces, the products of the explosion are, of course, diluted with large quantities of air, and the amounts of oxides of nitrogen present will usually be lower than 100 parts per million (0.01 per cent.). To determine these small quantities, a method was adapted from the usual procedure for the determination of the oxides of nitrogen in water analysis, applying the de-phenyl sulphonic acid method to give the total oxides of nitrogen as nitrogen peroxide or as nitrates. By the use of the method evolved, 10 parts of oxides of nitrogen as nitrate could be detected in one million parts of the air-oxides of nitrogen mixture with an accuracy of 5 or 6 parts per million.

Copies of Technical Paper 249 may be obtained by applying to the Director, Bureau of Mines, Washington, D.C.

Radium Mining in Cornwall

Ore Treatment Plant Required

Presiding at the ninth ordinary general meeting of the Société Industrielle du Radium, Ltd., held at the offices, Moorgate Station Chambers, E.C., on Wednesday, the chairman (Mr. H. T. Box) congratulated the shareholders upon the fact that the company had now reached the producing stage. A substantial quantity of valuable ore had been brought to the surface at the South Terras Mine, in Cornwall, and the company's manager estimated that the ore now in stock on the surface contained approximately 5,000 milligrammes of radium. As the market price of radium was approximately £16 per milligramme, it would be easily seen that the company possessed at the present time a very valuable asset.

Unfortunately, however, there was no market for the ore in this country, as there was apparently only one British firm manufacturing radium, and they were at present occupied in working off existing contracts of foreign ore. It was regrettable that English manufacturers took so little interest in radium. There was no doubt that radium could be manufactured from our ore with extremely profitable results, but, in our usual English manner, we were allowing a thriving industry to be monopolised by France and Germany. Owing to the adverse rates of exchange and the high cost of transport, these countries, although buying in small quantities, could not take the output we were able to give.

In these circumstances the directors had decided to erect the necessary plant at the mine to treat the ore down to the stage of sulphate of barium, in which form they had reason to believe there was a ready market for the product at highly remunerative rates, and if it was found necessary the company would arrange to complete the treatment up to the stage of producing the finished article.

A debenture issue on very attractive terms was, therefore, being made, to raise a sum of £15,000 for the purposes indicated, toward which subscriptions for about 60 per cent. had been promised. The directors would like to see the shareholders providing the necessary money and securing the benefit of these terms, as there was little doubt others would subscribe the money on these generous terms if the shareholders failed to do so.

Only during the last few weeks a very valuable patch of ore had been struck, and there was quite a substantial quantity of rich ore in sight, yielding between 80 to 100 milligrammes to the ton. It was anticipated that sulphate of barium would be produced by the end of March, 1922, so that there was every prospect of good profits being earned in the near future.

Minerals Separation Ltd.

Operation of the Froth Flotation Processes

At the sixteenth annual meeting of Minerals Separation, Ltd., held on December 22 at Winchester House, Old Broad Street, London, Mr. F. L. Gibbs, chairman of the company, said it had been impossible for the company to conduct active operations under the trade conditions experienced since their last meeting, and the board could not announce the completion of a large number of installations for the employment of the company's processes. Several installations of the company's fine-coal recovery plants were in course of erection, and as soon as they had one or two of them in regular work the advantages to be obtained by the use of the company's methods would be demonstrated clearly. The claims they had made for their fine-coal recovery methods had aroused great interest, and all that was now required to satisfy experts in the coal industry was the continuous running of large commercial plants, and they were so near that position that, in a few weeks' time, one plant certainly would be ready to commence operations. The innumerable tests which they had carried out on every class and combination of coal imaginable, and the fact that they had hardly met with any failure, would convince the shareholders of the versatility in application of their methods as applied to the washing of coal. This versatility became evident in the variety of products which might, within limits, be yielded at will, and in the uses to which the various cleaned products might be put. One of the most interesting applications of their methods was the conversion of a semi-coking coal into a coking coal by separating the portion which had coking properties from that which had none, rendering the latter available for separate combustion purposes. This last-mentioned application was really startling in its results, and should be of the greatest importance in this country.

Erection of Demonstration Plants

Industrial operations had proved the company's processes to be of remarkable efficiency, and the recovery of the coal present in the original material to be virtually perfect. This had been demonstrated in Wales, where it had been proved that 99.8 per cent. of the true coal present was recoverable in a cleaned product carrying only 1.2 per cent. of free dirt. As to the advantages to be gained by using the company's methods for the manufacture of metallurgical coke, it had also been proved by crushing tests that the physical strength of the coke thus cleaned was very much greater than in the case of the ordinary coke. It had also been semi-commercially demonstrated that on coals containing deleterious constituents, which neutralised any coking properties which the coal might otherwise possess, the injurious constituents could

readily be removed and two classes of fuel obtained, one of which was strongly coking in character, and the other suitable for briquetting or coal-dust firing. As to plants which had been and were being erected in this country, two pilot demonstration plants with a capacity of 100 tons in twenty-four hours had already been erected, and in addition four commercial installations were in process of erection, and inquiries had been received relating to the erection of numerous additional plants. The Powell Duffryn Steam Coal Co. had informed them that they had been so impressed with the experimental treatment by the company's process of their coking coals that they were now preparing plans for an installation of plant capable of providing for the treatment of their total coke requirements.

Treatment of Ores

As to the important part of their business which dealt with the application of their processes to the treatment of ores, the past twelve months had shown a marked tendency towards increased activity as regarded the treatment of metalliferous ores. In Australia the base metal mining industry continued throughout last year in a condition of depression and uncertainty which, combined with the prolongation of the strike at Broken Hill, prevented the company from deriving any income during that year. Since the close of the financial year the improved prices ruling for the metals produced on the Broken Hill field had permitted a substantial resumption of operations, although there were still some of the mines not operating. The directors felt assured that the time must come when many of the very important discoveries recently made by the company would find application in a country of such infinite resources as Australia.

As regarded their business in South Africa, their representative informed them that the keenest interest was being displayed in the company's processes by the Rand gold mining companies. Preliminary negotiations had already taken place relative to the erection of flotation installations, and he anticipated that they would soon have a number of plants operating in South Africa. A preliminary examination of mine deposits in Chile had been made with a view to acquiring their own raw material in that country, and they had acquired a substantial interest in a copper property. The field for the company's processes in South America was one of great promise. In regard to Italy, where trade conditions had been particularly bad, there were now indications that their business was on the verge of making a step forward. In France, Belgium, and Spain they had every reason to believe that the treatment of ores by the company's processes would increase.

New Ore Reduction Process

A substantial interest had been acquired by the company in a new ore reduction process, the owners of which possessed the world's rights for its use. The experiments conducted had been in every case successful, and a plant on a larger scale had now been erected, and important developments might be expected in the near future. With regard to the recovery of nitrate of soda from caliche, when they were successful in demonstrating the commercial value of their new methods they would be able to confer a benefit upon all nitrate producers.

Death of Colonel C. E. Cassal

We regret to record the death in London, on December 22, at the age of sixty-three, of Colonel Charles Edward Cassal, V.D., F.I.C., F.C.S. The eldest son of the late Professor Charles Cassal, Colonel Cassal was educated at University College School and University College, London, where he was medallist in chemistry and where for nine years he acted as chief demonstrator in the hygiene and public health laboratory. Colonel Cassal also acted as a censor of the Institute of Chemistry in 1892. Among the public appointments he had held were those of Public Analyst for Kensington, Westminster, Battersea, and portions of the county of Lincoln. He was for fifteen years editor of the *British Food Journal*, and wrote a number of papers and reports on sewage treatment and disposal, water supply, and the analysis of food and water. Colonel Cassal joined the 1st London Royal Engineer Volunteers in 1885, becoming Lieutenant-Colonel commanding in 1902, and afterwards Lieutenant-Colonel (hon. Colonel) commanding the London Brigade, R.G.A. (T. F.). His wife died in 1884, leaving a son and a daughter. The interment took place at Hampstead Cemetery on Wednesday, and was preceded by a memorial service at St. Helen's Church, North Kensington.

Catalogues Received

We have received from Blair, Campbell & McLean, Ltd., of Govan, Glasgow, a copy of an attractively prepared and highly interesting catalogue, entitled "Evaporating Plant." The catalogue, the typography of which is excellent, consists of ninety-five octavo pages, with some sixty-two illustrations in half-tone and line. It gives a full description of the Multiplex and Simplex patent film evaporators, and deals at some length with evaporators for special purposes, such as salting liquors, recovery of glycerine from soap lyes, &c. In order to save correspondence the catalogue contains a list of fifteen questions which should be answered by firms submitting inquiries. Tables giving the properties of saturated steam, specific gravity of solutions at 15°C., boiling points of solutions, comparison of hydrometer scales, &c., are also included. We understand that readers of The Chemical Age may obtain copies of this booklet on application to the firm at Glasgow, or to their offices at Sardinia House, Kingsway, London, W.C.2.

Meldrums, Ltd., of Timperley, near Manchester, have forwarded an advance copy of their new catalogue dealing with the Meldrum forced draught furnaces. These furnaces are claimed to be readily adaptable to all types of boilers, coppers, stills, driers, heating, annealing, and other furnaces, kilns, and chemical furnaces. The steam jet forced draught principle, using two jets per flue, is employed. The catalogue, which is on the loose-leaf system, contains illustrations of the furnaces in use in different industries.

An illustrated booklet dealing with the causes and effects of breakdowns of electrical plant has just been issued by the British Engine, Boiler and Electrical Insurance Co., Ltd., of 24, Fennel Street, Manchester. The brochure contains a number of "Hints to Attendants," fusing current of wires, temperature conversion tables, and other useful statistics and formulæ. Users of electrical plant may obtain a copy of this booklet on application to the company at the above address or at any of its branch offices.

Reavell & Co., Ltd., of Ranelagh Works, Ipswich, send us a copy of their Pamphlet No. 100, which illustrates and describes their rolling drum type rotary compressors. Used as air or gas compressors these machines are claimed to be capable of delivery at pressures up to 15 lb. per sq. inch. As vacuum pumps they find employment for exhausting tanks, priming centrifugal water pumps, &c.

Patents Court Case

A case of considerable interest to chemists has recently arisen as the result of an appeal from a decision of the Patent Office, and an important judgment has been given by the Solicitor-General. An application had been filed, asking for a patent for chemically pure phthalic anhydride, having a melting point above 130°C. (corrected). The inventors used as a starting substance, ordinary crude phthalic anhydride, which was obtained by known methods, and they subjected this substance to sublimation whereby they obtained phthalic anhydride of a high degree of purity, which they contended had not previously been obtained. The Patent Office objected to this claim in view of Sec. 38 (A) of the new Patents and Designs Acts, which states that "In the case of inventions relating to substances prepared or produced by chemical processes . . . the specification shall not include claims for the substance itself except when prepared or produced by the special methods or processes of manufacture described and claimed, or by their obvious chemical equivalents." At first sight this appears to be a complete bar to the setting up of a claim for a new product, but the inventors put forward the ingenious plea that their product was manufactured by a *physical* process, viz., sublimation, and not by a *chemical* process, and that this section of the Act was, therefore, not applicable. The Patent Office declined to accept this view, and the case, therefore, went to appeal before the Solicitor-General.

In giving judgment, the Solicitor-General declined to allow the appeal, and held that the pure phthalic anhydride was not prepared by sublimation only, but by a whole series of operations, of which sublimation was only the last stage which eliminated the impurities. The term "chemical process" was not to be interpreted in the strictly scientific sense as distinguished from a physical process, but in the more-general or vulgar sense as covering any process which might be used in a chemical factory. The invention, therefore, came within Sec. 38 of the Act, and the claim for the product was refused.

It will be evident from this judgment that the new clause in the Patents Act will be interpreted sufficiently widely to prevent anyone from obtaining a monopoly for a new chemical product, even though it may be obtained by a process such as sublimation or distillation which in the strict sense of the word is not chemical but physical.

Chemical Matters in Parliament

Technical Knowledge of Customs Officials

DR. MURRAY (House of Commons, December 19) asked the Chancellor of the Exchequer whether he was aware that, owing to the absence of technical knowledge of chemicals on the part of the Customs officials ordinarily concerned with the examination of goods arriving at the various ports throughout the country, it had become the practice of H.M. Customs to detain all parcels of chemicals and to refuse delivery to importers on the ground that inquiries were being made; that the consequent delay, even in the case of goods not dutiable, frequently amounted to weeks; and that it had become the practice of H.M. Customs to ignore any interim complaints which might be made by traders as to the great inconvenience that they were put to by the consequent hold-up of business; and whether he could devise some means whereby a decision might be given on the spot in any cases of this kind which involved only an ordinary working technical knowledge of the commodities in question?

Mr. Young said that in the case of chemicals entered as not liable to duty, as to which the examining Customs Officer was in doubt whether duty was not chargeable under Part 1 of the Safeguarding of Industries Act, it was necessary to submit a sample for expert opinion by the Government chemist, and this opinion was obtained with the least possible delay. But if the importer wished to obtain immediate possession of the goods, it was always open to him to do so on deposit of an amount sufficient to cover the duty in the event of the goods being ultimately held to be liable. As decisions were given on various substances, the officers at the ports would become more experienced in deciding liability without the necessity of submitting samples, and the inconvenience complained of would diminish. He was not, however, prepared to incur the expense attendant on the appointment of expert advisers at the various ports.

Applications for Orders

Major Barnes (House of Commons, December 19) asked the President of the Board of Trade how many requests for orders imposing a duty on manufactured goods under Part II. of the Safeguarding of Industries Act had been received by him; if so, how many he had approved; and whether he would publish a list of these applications forthwith so as to give adequate opportunity to those who desired to oppose them to prepare evidence which they would submit to any committee of investigation that might be appointed.

Sir W. Mitchell-Thomson said that, including formal complaints and inquiries with a view to formulating complaints, roughly some sixty trades had communicated with the Board. Two complaints, relating to fabric gloves and glove material and to domestic illuminating and mounting glassware, had been referred to Committees.

Alleged Detention of Soda Crystals

Major Barnes asked the Chancellor of the Exchequer whether he was aware that on December 9 a consignment of over 100 bags of washing soda crystals arrived at the east quay of the London Docks and was detained by H.M. Customs as being liable for duty under Part I. of the Safeguarding of Industries Act; that the importers sent special lorries to remove the goods, but were refused delivery by the Customs officials unless payment of a deposit to cover the *ad valorem* duty was made; that, upon refusal to pay such deposit, the goods were detained so that workmen had to be dismissed; and that it was not until the case was taken up by the British Chemical Trade Association that the goods were eventually released on December 12 as not being dutiable at all; and whether he would take steps to ensure that such interference with trade should not occur again?

Mr. Young said he was informed that these goods were not landed until the morning of Saturday, December 10, and that the two vans sent down on that day were allowed to take away full loads; the question of liability to Key Industry Duty was raised, but, in any case, there was no possibility of obtaining further deliveries on that day, as the workmen had then ceased for the day. The question of liability had been settled and the remainder of the goods were released before noon on Monday, December 12. He thought this could hardly be described as an interference with trade.

American Notes

E. I. du Pont de Nemours & Co., Inc., have produced a new dye known as Pontachrome Blue Black R. Conc., which is said to be particularly suitable for dyeing wool and a good basis with suitable shading colours for navy blue. The company are offering the services of a specialist to demonstrate the dye.

Twenty-six new chemical companies, with a capital of $50,000, or more, were registered during October as against thirty-five in September. The combined capital of chemical companies registered during the first ten months of the present year totals $98,515,000.

A comparatively easy method of handling liquid chlorine commercially was demonstrated at a recent meeting of the National Safety Congress. A 10 lb. cylinder of chlorine was tipped up in a rack so that liquid instead of gaseous chlorine would run out when the valve in the neck of the cylinder was opened. A round flask caught the liquid, and the gas that boiled off during the experiment passed through a guard bottle and was absorbed in caustic soda solution in two further bottles. When the valve on the cylinder was opened, the first liquid that ran out immediately evaporated until the valve, tubing and round flask were chilled by the evaporating liquid to 33.6°C. This took only a few minutes. About an ounce of liquid chlorine was run into the flask; this boiled quietly for over an hour before the last drop passed off in gas form, in spite of the absence of any insulation.

Mann & Cook (West Africa), Ltd.

Company to be Wound-up Voluntarily

THE committee of shareholders appointed at a general meeting of Mann & Cook (West Africa), Ltd., on November 18, and consisting of the Hon. A. Hudson (chairman), Mr. T. L. Gilmour, Colonel J. C. Wedgwood, Mr. J. Hall, and Mr. G. R. C. Westropp (*see* THE CHEMICAL AGE, Vol. V., p. 671), report that since their appointment they had held several Conferences with the board. It became apparent at once, the report states, that owing to the position of the company's affairs any question of reconstruction was impracticable. As regards the possibility of selling the assets, energetic efforts have, with the concurrence of the committee, been made by the board in this direction since the meeting, but nothing of a definite or satisfactory character has resulted, and it is obvious that considerable difficulties stand in the way and that it must take some time for any negotiations to be brought to a head. In any case, and in the view of the committee, these negotiations can just as effectively be carried on by a liquidator as by the board. In conclusion, the committee are of the opinion that very little, if anything, is likely to be available in the liquidation as a return of capital to the shareholders.

At a meeting of shareholders held at Cannon Street Hotel on December 22, Sir Richard Cooper (the chairman) moved that the company be wound-up voluntarily. Mr. Grant Hooper moved an amendment to the effect that the company be placed in liquidation, but that "the Board of Trade, or whoever the proper official may be, shall be put in charge, and we appoint him liquidator." Mr. Grant Hooper's amendment was carried on a show of hands by twenty-three for, and six against. A poll was demanded, and the amendment was defeated by a majority of 59,000. A poll taken on the resolution showed 59,896 for and 3,625 against.

Brunner Mond Enterprise in Japan

ACCORDING to the *Yakugyo Shuho* an important contract has been entered into between the Nihon Kwagaku Hiryo Kaisha and Brunner Mond & Co., Ltd. According to the terms of the contract the British firm will supply soda ash for the manufacture of caustic soda at the Onoda factory owned by the Japanese company, and the latter will undertake the sale of the manufactured goods. As to the provision of the profit accruing from the enterprise, Brunner Mond will take 60 per cent. and the Japanese concern 40 per cent. According to returns compiled by the soda and bleaching powder manufacturers' union, the export of bleaching powder during the first six months of 1921 totalled 3,752,666 lb. valued at 443,291 yen, and that of caustic soda 1,589,455 lb. valued at 140,304 yen; the import of caustic soda during the same period amounted to 2,490,522 lb. valued at 240,752 yen, and that of soda ash 22,018,666 lb. valued at 876,881 yen.

From Week to Week

The Manchester offices of BAIRD & TATLOCK, LTD., are now at Sarsden Buildings, 34, Great Ducie Street.

MR. C. W. BARNISH, a deputy director of Lever Brothers, Ltd., has been appointed a director of that company.

During November INCREASES OF CAPITAL amounting to £157,500 were notified by United Kingdom chemical firms.

NOBEL INDUSTRIES, LTD., have been awarded the sum of £4,239 by the War Compensation Court for war disturbance.

The registered office of the BRITISH OXYGEN CO., LTD., has been transferred to Angel Road, Upper Edmonton, London, N. 18.

Fifteen local hospitals benefit from the £1,047 raised during 1921 by the EMPLOYEES OF LEVER BROTHERS, LTD., Port Sunlight.

LORD LEVERHULME has consented to preside at the fifty-ninth annual dinner of the Newspaper Press Fund, to be held early next year.

Extensive DEPOSITS OF KAOLIN are reported to have been discovered in Austria. In this connexion it is proposed to erect a refractory plant at Wellersdorf.

The annual report of Minerals Separation, Ltd., states that the directors have decided not to proceed with options obtained by them over certain COLLOIDAL FUEL PATENTS.

The trade returns for November, presented at a meeting of the Llanelly Harbour Trust last week, showed a further improvement, PATENT FUEL EXPORTS having risen to 2,210 tons.

The name of Major R. B. BICKERDIKE, of Bowdler & Bickerdike, manufacturing chemists, of Church, Accrington, has been placed on the commission of peace for the County of Lancashire.

A yield of 100 gallons of crude oil to the ton is said to have been obtained by means of A DRY DISTILLATION PROCESS worked by the Oil-Shale Products & Coal Co., Ltd., New South Wales.

Mr. Herbert Caress, the first headmaster of the Cheshire Elementary School at Winnington, Northwich, built by BRUNNER, MOND, & CO., LTD., has retired after thirty-five years' service.

THE MIDLAND VINEGAR CO., LTD., of Aston Cross, Birmingham, has subscribed £100 to the fund promoted by the Lord Mayor of Birmingham for providing boots and clothing to the destitute poor.

THE COAL SMOKE ABATEMENT SOCIETY state that during the present session of the House of Commons the officials in charge have been burning smokeless fuel obtained from works at Barnsley.

A CONCERT promoted by the staff of the Shell and Royal Dutch group of oil companies, and held at the Alhambra Theatre, London, in October last, realised £1,556 3s. 7d. for the London Hospital.

The Council of the Institution of Gas Engineers have appointed MR. T. F. E. RHEAD, chief chemist at the works of the Birmingham Corporation Gas Department, a member of the Gas Investigation Committee.

MR. P. N. JAMES, of W. J. Bush & Co., Ltd., manufacturing chemists, of Ash Grove, Hackney, London, has announced his intention of retiring from the presidency of the Boileau Bowling Club, which office he has filled during the past three years.

DR. LEWIS SIMONS has been appointed to the London University readership in physics, tenable at Birkbeck College, London, as from March 1 next. Since 1917 Dr. Simons has held the post of lecturer in physics in the University of Capetown.

THE ANNUAL EXHIBITION of the Physical Society and the Optical Society will be held on January 4 and 5 at the Imperial College of Science, South Kensington, from 3 to 6 and from 7 to 10 p.m. Lectures and demonstrations will be given.

SIR CHARLES BURGE, whose death was announced in THE CHEMICAL AGE last week, was formerly deputy-chief of the Government laboratory at Somerset House, London. He had served for seven consecutive years as Mayor of Kingston-on-Thames.

The Treasury have determined that as from yesterday (Friday) until further notice the rate of interest to be allowed under Section 54 of the Finance Act, 1916, on sums deposited with the Commissioners of Inland Revenue for the purpose of satisfying any EXCESS PROFITS DUTY shall be 3 per cent. per annum.

It was announced in the West Midlands on December 23 that as a result of a joint meeting of manufacturers and operatives, the glass workers had agreed to a REDUCTION IN WAGES of half-a-crown in January and a similar sum in February. From next June a further reduction will be made, based on the cost of living.

At a meeting of the employees of CROSS'S CHEMICAL CO., LTD., Falkirk, last week, consideration was given to the new reduced rates of wages offered by the firm. It was ultimately agreed by a large majority to accept the terms offered by the company, and it is expected that work will be resumed immediately.

MR. J. HERBERT E. EVANS, son of the late Mr. John James Evans, and nephew of the late Sir Edward Evans, has been elected chairman of Evans Sons, Lescher & Webb, Ltd., Liverpool and London, in succession to Mr. William Paterson Evans, who died on November 8 last. Mr. E. A. Webb will continue to act as deputy-chairman.

A special exhibition consisting entirely of GLASS BOTTLES was held in the Great Northern Hotel, Leeds, on December 13. The exhibits were of French, German, Japanese, Belgian, and Czecho-Slovakian manufacture, and arrangements for their display were made by the United Glass Bottle Manufacturers of Great Britain and Ireland. Several firms found that amongst the samples of certain countries' manufactures were instances in which their own special brand had been added to the bottle, even to the name of the United Kingdom manufacturing firm.

The twenty-second annual meeting of the SCIENCE MASTERS' ASSOCIATION will be held in the chemical department of the Imperial College of Science and Technology (Royal College of Science), London, on January 3-4 next. The president of the Association, the Master of Balliol, will deliver his address on January 3, taking as his subject "Science and History." Physical Chemistry in Schools and Post-Certificate Science for Non-Specialists is among the topics down for discussion. Exhibitions of apparatus and books by members, instrument-makers, and publishers will be open during the meeting.

Writing from Durban, a correspondent of THE CHEMICAL AGE announces the death, on November 7 last, at the age of forty-seven, of MR. WILLIAM KING, F.C.S., who for the past seven years was chief chemist to the Zululand Sugar Milling Co., Ltd., Empangeni, Zululand. Mr. King, who received his early training at the Sugar Refineries, Greenock, and the Royal Technical College, Glasgow, proceeded to South Africa in 1897 to take up the post of chief chemist to the South African Sugar Refineries, Durban. During his stay in Durban Mr. King acted for some time as lecturer in chemistry at the Durban Technical College.

In pursuance of the Women and Young Persons (Employment in Lead Processes) Act, 1920, the Home Secretary has issued orders, in the same terms as the draft orders issued in April last, except for a SLIGHT ALTERATION in the wording of paragraph 2 of the order prescribing the cloakroom, messroom and washing accommodation. Paragraph 2 of the order prescribing the medical examinations requires the employer to supply every woman and young person employed in any process to which the order applies with a Health Register in the approved form. Copies of this Register (Form 616) and copies of the orders can be obtained from H.M. Stationery Office, Kingsway, London, W.C. 2.

In a circular to shareholders of the British Cyanides Co., Ltd., the directors state that the PETITION OF RIGHT has been adjudicated upon in favour of the company. The exact amount to be paid by the Government has yet to be definitely ascertained, but there can be no doubt, they add, that a substantial sum will be recovered. The first trial of the new barium furnace has fully realised their expectations. As was anticipated, minor alterations were found to be necessary, and are now in hand, and a further trial will be made directly they are completed. An addition to the directorate has been made, subject to confirmation at the next general meeting, by the appointment of Brigadier-General O. K. Chance, D.S.O., to a seat on the board. General Chance has served the company for some time past in the capacity of sales manager, and will continue, as a director, to control the sales department.

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HYDRIDES. Metallic hydrides. Part II. Hydrides of the alkaline earth metals and lithium. F. Ephraim and E. Michel. *Helv. Chim. Acta*, December 1, 1921, pp. 900-924.

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Abstracts of Complete Specifications

171,661. Compositions and Technical Products Containing Ethers of Carbo-Hydrates Having the Empirical Formula n ($C_6H_{10}O_5$), Their Conversion Products and Derivatives. L. Lilienfeld, 1, Zeltgasse Vienna. International Convention date, May 15, 1920.

The process is for producing compositions for use as artificial leather, films, lacquers, varnishes, paints, insulating materials, cements, &c. The compositions contain alkyl or aralkyl derivatives of carbohydrates, such as cellulose, starch, dextrine, &c., and their conversion products and derivatives. Ethers insoluble in water but soluble in organic solvents (*e.g.*, ethyl ether of cellulose or benzyl ether of cellulose of a higher degree of alkylation) are preferably used, and are dissolved in a volatile solvent such as benzene, benzene-alcohol, carbon tetrachloride, chloroform, or chloroform-alcohol. The solution is mixed with the oils obtained by treating solvent naphtha, crude benzol and the like, with sulphuric acid and fractionally distilling as described in Specification No. 163,271 (*see* The Chemical Age, Vol. V., p. 77). These oils are themselves solvents for the alkyl and aralkyl derivatives of cellulose, etc., so that the quantity of volatile solvent may be reduced. Other substances may also be added, such as cellulose nitrates, acetates or other esters, camphor, phosphoric esters of the phenols, animal and vegetable oils, &c. Several detailed examples of the preparation of substances such as celluloid and artificial leather are given.

171,722. Zinc or Zinc and Lead, Process of Producing. C. E. Cornelius, Narvavagen 22, Stockholm. Application date, May 27, 1920.

When zinc is obtained from a reduction furnace it is difficult to obtain the entire quantity of the metal in the liquid form, part of it being obtained in the form of dust owing to the presence of large quantities of carbon monoxide and dioxide in the zinc vapour. In the present invention the vapour from the reduction furnace is passed through cooled channels or tubes which are maintained at 60-70° C. by means of cooling water or air. The zinc is thus obtained entirely in the form of powder, which is then transferred to another furnace and liquefied. When the zinc ores contain lead a mixture of zinc and lead is obtained.

171,729. Tanning Agents, Manufacture of. A. G. Bloxam, London. (From Gerbund Farbstoffwerke H. Renner & Co., Akt.-Ges. Billhorner-Canalstrasse 20, Hamburg, 27, Germany.) Application date, June 24, 1920.

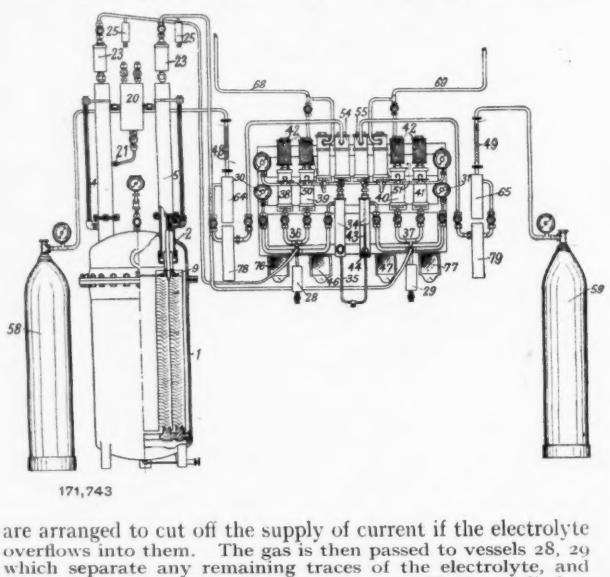
In the manufacture of artificial tanning agents by the condensation of phenols with formaldehyde it has been necessary to effect the condensation in acid solution. It is now found that better tanning agents may be produced by effecting the condensation in alkaline solution and then subjecting the resinous condensation product to a sulphonation process. The basic materials may be a monohydric or polyhydric phenol or a homologue, and formaldehyde or a substance from which it is developed in presence of alkali or other inorganic or organic base. The resinous condensation product is sulphonated in two parts, one of which is converted into sparingly soluble or insoluble products, and the other into easily soluble products. The two products are then mixed and a colloidal solution is obtained which has tanning properties. In an alternative process, a single portion of the resin may first be sulphonated to produce insoluble products, and then further sulphonated under conditions which convert these products into colloidally soluble substances. In another alternative, part of the resin is sulphonated to form a soluble product which is then mixed with another portion of the untreated resin. Any of the tanning agents thus produced may be improved by oxidation, for instance by electrolysing it and allowing the liberated oxygen to react with it.

171,739. Carbon Monoxide, Apparatus for the Detection and Estimation of. L. A. Levy, 31, Shoot-up Hill, Cricklewood, Middlesex, and R. H. Davis, 187, Westminster Bridge Road, London. Application date, July 20, 1920.

The apparatus is for estimating the proportion of carbon monoxide in air or gas which contains no other inflammable gases. A definite volume of the gas to be tested is drawn in succession through a drying agent such as granular calcium chloride, a reagent to oxidise the carbon monoxide to carbon dioxide, and a second drying agent. Heat is generated by the oxidation of the carbon monoxide, and the temperature of the gas on leaving the second drying agent is measured by a thermometer which is preferably graduated to give direct readings in percentages of carbon monoxide. An additional absorbent such as activated charcoal may be employed in front of the oxidising agent so as to absorb any hydrocarbon such as benzene, which may be present in the gas. The oxidising agent may consist of a catalytic mixture of oxides such as is used in connexion with respirators for protection against carbon monoxide, or it may consist of a non-catalytic mixture consisting of granulated pumice coated with iodine pentoxide and fuming sulphuric acid.

171,743. Gas Under Pressure, Apparatus for the Production by Electrolysis. E. Vesme, 121, Corso Vittorio Emanuele, Turin, Italy. Application date, July 26, 1920.

The plant is for generating oxygen and hydrogen and storing them at any desired pressure. The electrolyser 1 is constructed of metal and contains two or more co-axial columns, the tops of two adjacent columns being surmounted by a collecting ring 9. A delivery pipe 4 for one gas is connected to the cover 2, while the other delivery pipe 5 projects downwards into the electrolyser. The apparatus is filled with caustic soda solution up to the level of the branch pipe 21, which is connected to tank 20 containing water for replenishing the electrolyte when the level of the latter falls. Separating vessels 23 are provided for the gases, and safely vessels 25



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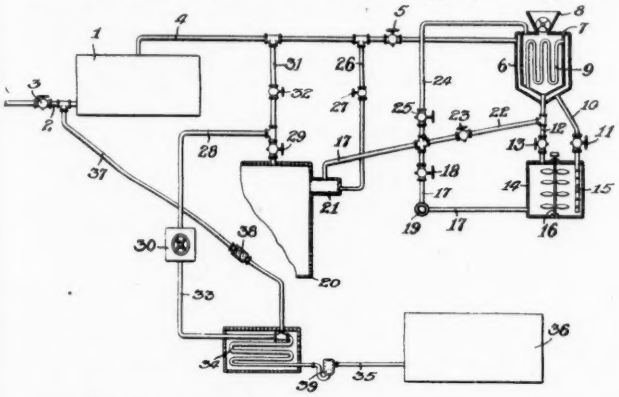
are arranged to cut off the supply of current if the electrolyte overflows into them. The gas is then passed to vessels 28, 29 which separate any remaining traces of the electrolyte, and thence to a pressure-equalising device 34. The two cylinders 34 are connected by a tube 35 containing mercury, on the surfaces of which are two metallic floats 44. If the gas pressures in the cylinders 34 are unequal, the mercury is displaced and electrical contact is made with a rod 43 which is connected to a relay 46 or 47. These relays control the circuits of electro-magnets 42 which operate the valve 39, 40, and thus release the excess of either gas to the pipes 68 or 69. The pressure of the gas is indicated by gauges 30, 31 which include an electric circuit which may be adjusted so that at any desired pressure, relays 76, 77 are actuated; these relays control the electro-magnets of similar release valves 38, 41. The gases released at the desired pressure pass through pipes 50, 51, stop valves 54, 55, pipes 52, 53, vessels 65, 64, 78, 79, and purifiers 48, 49, to reservoirs 58, 59. The purifiers 48, 49 are heated by electrical resistance coils and contain a spongy platinum or palladium catalyst which effects the combination of any traces of oxygen or hydrogen which may be present in the hydrogen or oxygen respectively as delivered to the purifiers.

171,751. Pure Caustic Alkalis from Impure Lyes. K. Heinemann and Hoesch & Co., Pirna, Saxony, Germany. Application date, August 14, 1920.

The object is to treat impure lyes which have been used as reagents so as to recover pure caustic alkali, hydrogen, and oxygen from them. The lye is electrolysed using a cathode of mercury and an anode of platinum, nickel, or silver. The alkali amalgam thus formed is subsequently decomposed by water to form pure caustic alkali. To prevent contamination of the oxygen liberated at the anode with hydrogen, the liquor is caused to flow from the anode to the cathode through a separating diaphragm of wire gauze. Any passage of hydrogen in the reverse direction is thus avoided.

171,785. Hydrogenating and Distilling Hydrocarbons from Bituminous Substances. A. E. O'Dell, London. (From the Canadian Finance and Trading Co., Ltd., 511, Union Bank Buildings, Victoria, B.C., Canada). Application date, August 23, 1920.

In distilling bituminous sand to obtain hydrocarbons considerable loss is liable to occur due to dehydrogenation, and the object is to avoid this loss by treating the sand before and/or during distillation with hydrogen under pressure. Preferably the sand is treated with hydrogen until no further absorption occurs, the sand is distilled in an atmosphere of hydrogen, and the distillate is condensed in an atmosphere of hydrogen. A gas from which hydrogen can be liberated is delivered by a pipe 2 to a chamber 1 in which the hydrogen is liberated in a heated condition. The hot hydrogen passes through a pipe 4 to the jacket 6 and heating tube 9 of the vessel 7 in which the sand is melted. Additional external heat may be supplied i



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necessary for melting the sand. The sand passes through a pipe 12 to a vessel 14, where it is agitated by a device 16 and mixed with hydrogen supplied by a perforated pipe 15. The treated sand passes through the pipe 17 and pump 19 to a still 20. A pipe 22 is also provided through which additional material may be supplied without passing through the mixer 14. Any hydrocarbon vapour liberated in the vessel 7 passes through the pipes 24, 17 to the still 20. Additional hydrogen may be supplied to the still through the pipe 26. The hydrocarbon vapour from the still 20 contains an excess of hydrogen and is delivered through a pipe 28 to a compressor 30, and thence through a pipe 33 to a condenser 34. Additional hydrogen may be added to the vapour through the pipe 31. Gases which are not condensed in the condenser 34 are returned by the pipe 37 to the chamber 1 for use again. The condensed and highly saturated hydrocarbons are delivered through a pipe 35 to a tank 36. The plant is capable of treating low-grade raw material for the production of a high yield of valuable hydrocarbon products.

171,805. Gasification of Coal, Plants and Processes for. Woodall, Duckham, & Jones (1920), Ltd., and Sir A. M. Duckham, 52, Grosvenor Gardens, London, S.W. 1. Application date, September 1, 1920.

A vertical retort is arranged immediately above a water gas generator into which the lower end of the retort opens through an arch forming the top of the generator, so that the cross section is suddenly enlarged. The downward passage of the fuel from the retort leaves a free space at this enlargement, and the tar produced in the retort is collected and sprayed into this free space at one side of the retort, so that its gasification is facilitated.

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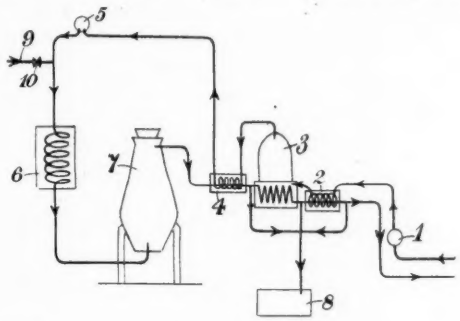
171,859. Magnetic Separators. H. H. Thompson, 137, Gravelly Hill, Birmingham, and A. E. Davies, The Ingle, Ladbrook Park, Tanworth-in-Arden, Warwickshire. Application date, October 8, 1920.

The object is to design a magnetic separator for liquids or finely divided solids in which the magnetic lines of force are concentrated by reducing the air space as much as possible. The material is passed through a trough containing transverse iron bars, which are magnetised by magnets below the trough. Grids formed of iron bars are spaced above the bars at the bottom of the trough, and the material to be separated is passed between the two sets of bars.

171,909. Low Temperature Distillation of Fuel. Merz & McLellan, 32, Victoria Street, Westminster, London, S.W. W. T. Bottomley, 21, Elmfield Gardens, Gosforth, Newcastle-on-Tyne, and E. G. Weeks, 1, Tynedale Avenue, Monkseaton, Northumberland, Application date, December 3, 1920.

The apparatus is for the low temperature distillation of fuel by means of highly superheated low pressure steam. The object is to recover the heat contained in the steam and hot gases leaving the retort although the steam itself cannot be returned to the superheater and the retort owing to the tar and other impurities. Steam is passed from a boiler through



171,909

a pipe 9 and reducing valve 10 to a low pressure high temperature superheater 6 and thence to the bottom of the retort 7. The steam and distilled gases pass through three heat interchangers 4, 3, 2 in series, in which the tar and steam are condensed and collected in the vessel 8. To obtain the necessary supply of fresh steam, water is passed by a pipe 1, through the heat interchangers 2, 3, 4 in counter current to the hot gases from which the necessary heat is obtained. The steam then passes through a pressure booster 5 to the superheater 6.

171,918. Oil Shales, Method of Treating. S. H. Dolbear, 625, Market Street, San Francisco, Cal., U.S.A. Application date, January 4, 1921.

The object is to remove the waste of oil shale so that the subsequent distillation of the shale may be effected with a smaller consumption of fuel. The shale is ground and mixed with water and with a small quantity of oil if no free oil is present in the shale. The mixture is then aerated by introducing air, and the froth carries with it to the surface the organic compounds present in the shale. If the earthy material in the shale tends to become colloidal on grinding, a small quantity of an electrolyte such as sulphuric acid may also be added.

Note.—Abstracts of the following specifications which are now accepted appeared in The Chemical Age when they became open to inspection under the International Convention: 149,320 (L. Lilienfeld) relating to ethers of cellulose and derivatives, *see* Vol. III. p. 543; 150,962 (T. Goldschmidt Akt.-Ges.) relating to production of alkali sulphate and hydrochloric acid, *see* Vol. III., p. 634; 151,988 (E. Barbet et Fils et Cie.) relating to distilling and rectifying columns, *see* Vol. III., p. 713; 153,265 (Norsk Hydro Elektrisk Kvaelstofaktieselskab) relating to dinitrophenol, *see* Vol. IV., p. 106; 160,148 (Barrett Co.) relating to manufacture of resins, *see* Vol. IV., p. 592; 163,018 (L. Lilienfeld) relating to ethers of carbohydrates, *see* Vol. V., p. 47; 163,271 (L. Lilienfeld) relating to high boiling oils from aromatic hydrocarbon mixtures, *see* Vol. V., p. 77; 165,759 (W. N. Hirschel and Amsterdamsche

Superfosfaatfabriek) relating to manufacture of phosphoric acid, *see* Vol. V., p. 287; 165,770 (A. Zinke) relating to manufacture of perylene, *see* Vol. V., p. 287.

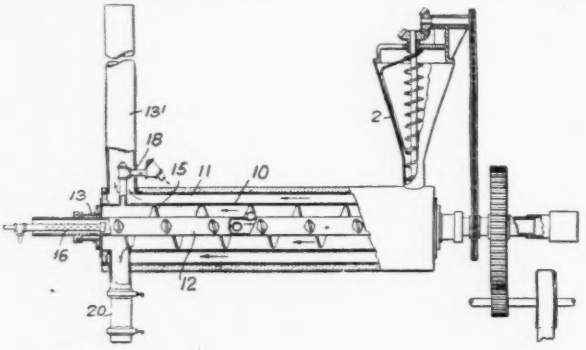
International Specifications not yet Accepted

171,074. TREATING GASES ELECTRICALLY. E. Slatineanu, Cressy-Onex, near Geneva. International Convention date, November 5, 1920. Addition to 154,213 (*see* THE CHEMICAL AGE, Vol. IV., p. 165).

A reaction between a gas such as hydrogen and a liquid is effected in contact with a metal which is capable of absorbing the gas and which is in contact with both gas and liquid. A finely divided metal may be used such as platinum black or platinum sponge, or palladium or nickel. Electro-positive metals such as sodium, potassium, rubidium or cæsium, may also be used. An electric discharge is passed from the metal to the other electrode. The absorbent electrode may be in solid form, or a liquid sodium potassium alloy may be used.

171,075. CRACKING OILS AND DISTILLING COAL. Trent Process Corporation, 1440, U Street, Washington, U.S.A. (Assignees of W. E. Trent, 908, G. Street, Washington, U.S.A.). International Convention date, November 4, 1920.

A mixture of one part of hydrocarbon oil and two parts of finely-divided coal, anthracite, lignite or coke is delivered to a horizontal retort 10. A hollow rotating shaft 12 carries



171,075

hollow helical blades 15, and hot gases are passed into these blades from the burners 16. The mixture in the retort is heated to 300°-350° C., at which temperature the oil is cracked and the coal partly distilled. The hot gases return through a jacket 11 to an outlet 13; and the distillate passes through a pipe 18 to a condenser and scrubber in which light oils are collected.

171,078. DYES. Farbwerke vorm. Meister, Lucius & Brüning. Hoechst-on-Main, Germany. International Convention date, November 1, 1920.

A mixture of alkali indigo white with alkali leuco compounds of quinone vat dyestuffs such as sulphurised arylido-halogen-quinones or non-sulphurised arylido-quinones, is evaporated to dryness *in vacuo* to obtain stable dry vat preparations. Substances such as molasses or sulphite cellulose pitch may also be added.

171,079. CARBURETTED WATER GAS. Fuller-Lehigh Co., Fullerton, Pa., U.S.A. (Assignees of G. H. Kaemmerling, 1441, West Hamilton Street, Allentown, Pa., and H. W. Benner, 614, Avenue B, Bethlehem, Pa., U.S.A.). International Convention date, November 2, 1920.

During the steaming period in the manufacture of water gas, powdered bituminous coal is injected above the fire so that it is distilled by the hot gases, and the water gas is thereby carburetted. The gas may be stored under pressure in a reservoir and used for injecting the powdered coal. The coke residue provides some or all of the fuel required for producing the water gas.

171,094. CONDENSATION PRODUCTS FROM FORMALDEHYDE, &c. F. Pollak, 20, Langezasse, Vienna. International Convention date, November 3, 1920.

A mixture of urea, thiourea, or their derivatives, and formaldehyde or a polymer is heated with a base such as ammonia, hexamethylene-tetramine, pyridine, or urea itself. A colourless liquid is produced which is soluble in water, but on further heating the liquid is converted into a product resembling rubber which is insoluble and infusible. Further heating, which may be combined with pressure, converts this substance into a hard infusible transparent substance insoluble in acids and alkalies. The liquid product may be used for impregnating various materials, or it may be mixed with various filling materials before the hardening treatment.

Specifications Accepted, with Date of Application

146,166 and 146,180. Tanning agents, Manufacture of. H. Renner, and W. Moeller. February 6 and 28, 1914. 146,180 addition to 146,166.

146,181. Tanning agents, Manufacture of. Gerb und Farbstoffwerke H. Renner & Co. November 12, 1918.

146,839. Coke oven gases, Treatment of. J. I. Bronn. October 24, 1914.

147,861. Coal tar derivative disinfectant, Process for producing a solidified emulsifiable. A. Franck-Philipson. March 15, 1918.

149,915. Chemical production and research, Apparatus for. M. Brutzkus. August 4, 1919.

151,596. Cyanamide salts into urea, Process for the conversion of. Soc. d'Etudes Chimiques pour l'Industrie. September 26, 1919.

151,597-8, 154,562. Mixed manure containing a variable amount of nitrogen and phosphate, Process for the manufacture of. Soc. d'Etudes Chimiques pour l'Industrie. September 26, September 26, and November 25, 1919. 151,598 and 154,562 additions to 151,597.

154,563. Mixed manure containing a variable amount of nitrogen and fertilising salts, Process for the manufacture of. Soc. d'Etudes Chimiques pour l'Industrie. November 25, 1919.

159,853. Mixed nitrophosphate manure, Process for the manufacture of. Soc. d'Etudes Chimiques pour l'Industrie. March 2, 1920.

159,854. Nitrogen manure, Process for the preparation of. Soc. d'Etudes Chimiques pour l'Industrie. March 2, 1920.

160,149. Intermingling of gas and liquid, Apparatus for effecting. Soc. Franco-Belge de Fours à Coke. September 8, 1920.

172,337. Sulphate of ammonia, Apparatus for use in the manufacture of. R. P. Douglas. September 20, 1920.

172,356. Ores or metallurgical products, Preparatory treatment of. O. Y. Imray. (*S. Jackson & Co.*) July 28, 1920.

172,358. Expressing liquids from materials containing the same, Methods and apparatus for. J. W. Hinchley. August 3, 1920.

172,359. Peat, Method of and apparatus for treating. W. W. Blair. August 3, 1920.

172,390. Separating finely-divided minerals from their ores by froth flotation, Process of and apparatus for. F. J. Brougham. (*D. P. Hynes.*) September 2, 1920.

172,401. Retorts. G. M. Johns, J. H. Curran, F. W. Lowe, and J. B. Trescott. September 3, 1920.

172,411. Metallic oxides (ores), Process and furnace for the reduction of. H. F. Eriksson. September 6, 1920.

172,413. Water-gas, Process and apparatus for the production of. N. J. M. Willemse. September 7, 1920.

172,491. Filters. A. M. Capro. October 29, 1920.

172,513. Mixing, stirring, or agitating apparatus. W. W. Veitch, M. H. Rowlands and Rowlandson (Engineers), Ltd. November 26, 1920.

172,517. Centrifugal separators. A. Ohno. November 30, 1920.

172,546. Producer-gas and the like, Furnaces used in the manufacture of. R. M. Brooke and W. Whitworth. January 18, 1921.

Applications for Patents

Archer, R. S. Process of heat treatment of metallic alloys. 33,656. December 14. (United States, January 4.)

Barnsley, G., and Wallace, F. Apparatus for cooling, humidifying, &c., air or gases. 33,565. December 14.

Barrett Co. Manufacture of resin. 33,671. December 14. (United States, December 22, 1920.)

Blyth, C. E. Apparatus for separating air or gas from material suspended therein. 33,282. December 12.

Buckley, C. A. M. Centrifugal drying-machines. 33,938. December 16.

Caron, V. E. Ejection and compression of gases and vapours. 33,526. December 13.

Hocking, H. Apparatus for separating solid matters from fluids, or fluids from vapours or gases. 33,827. December 16.

Hodson, J. and T. Manufacture of refractory dolomite basic bricks, &c. 34,017. December 17.

Meter, J. W. van. Chlorine control. 33,359. December 12.

Silberrad, O. Chlorination of organic compounds. 33,908. December 16.

Soc. l'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude and J. Claude. Manufacture of hydrogen. 33,783. December 15. (France, January 21.)

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

Thursday, December 29, 1921.

OWING to the intervention of the holidays there is little change to report in the situation of chemicals generally.

The firmer tendency which we have recently indicated is still maintained.

The Export situation presents no special feature.

General Chemicals

ACETONE is inclined to be higher in price and remains in good demand.

ACID ACETIC is in fair request on both Home and Export account. Prices are inclined to harden.

ACID CITRIC remains uninteresting.

ACID FORMIC exhibits a brighter tone, but the volume of business is still comparatively small.

ACID OXALIC is a firm market, and high prices are not unlikely.

ACID TARTARIC remains dull and featureless.

BLEACHING POWDER is unchanged.

COPPER SULPHATE remains a nominal market, with continued paucity of export inquiry.

FORMALDEHYDE is a firm market, but the demand seems to have slackened.

IRON SULPHATE is unchanged.

LEAD ACETATE is still a slow market, and the trade is principally in retail quantities.

LEAD NITRATE is unchanged.

LITHOPONE.—The price is firm, but the demand at the moment is almost nominal.

POTASH CARBONATE is still on offer for resale account. The market remains weak.

POTASH CAUSTIC appears to have found its level, although orders are few and far between.

POTASH CHLORATE is unchanged.

POTASH PRUSSIATE fully maintains the recent advance in price, and makers are still sold.

SODA ACETATE has not been in such active demand, but the price is firm.

SODA NITRITE is featureless.

SODA PRUSSIATE.—An active business has been passing and the price has materially advanced. Generally speaking, the makers are well sold over the first half of next year.

Coal Tar Intermediates

In view of the Christmas holidays there have only been two full working days since our last report, and there is consequently very little change to indicate.

The tone, however, continues healthy, and there was less slackening off before Christmas than is usually the case, while buying on a moderate scale has been resumed immediately on conclusion of the holiday.

ALPHA NAPHTHYLAMINE displays a mild upward tendency.

ANILINE OIL AND SALT continue in quiet demand.

BENZIDINE BASE has been inquired for, and a certain amount of forward business has been placed.

BETA NAPHTHOL.—This intermediate has been more interesting, and a very fair business has been passing at recent values. A slight rise in price is anticipated before long.

DIMETHYLANILINE continues to pass quietly into consumption at recent values.

DIPHENYLAMINE has been inquired for both on home and export account, and is very firm.

NITROBENZOL is featureless.

RESORCIN.—A few inquiries have been received, but little business is passing.

Coal Tar Products

There is little business doing in Coal Tar Products owing to a large number of the works being closed because of the holidays.

90's BENZOL is quoted at 2s. 5d. to 2s. 6d. on rails.

PURE BENZOL is worth 3s. on rails in the Midlands and 3s. 6d. in London.

CREOSOTE OIL is in fairly good demand, and is quoted at 6d. on rails in the North and 6½d. in the South. The market for forward delivery seems to be a little firmer, and creosote is quoted at 5¾d. to 5¾d. on rails in the North, and 6d. in the South over January—June.

CRESYLIC ACID is very uninteresting, with practically no business passing. The Pale quality is quoted at about 2s. on rails, and the Dark about 1s. 9d.

SOLVENT NAPHTHA is also in poor demand, and is worth about 2s. 5d. on rails in the Midlands and 2s. 9d. in London.

NAPHTHALENE has also a poor market, with prices unchanged.

PITCH.—The demand is well maintained and prices are firm.

Sulphate of Ammonia

The position is unchanged.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	10	to	0	2	0
Acetone oil	ton	87	10	0	to	90	0	0
Acetone, pure	ton	87	10	0	to	90	0	0
Acid, Acetic, glacial, 99-100%	ton	52	10	0	to	55	0	0
Acetic, 80% pure	ton	45	0	0	to	48	0	0
Arsenic	ton	95	0	0	to	100	0	0
Boric, cryst	ton	65	0	0	to	68	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6½	to	0	0	7
Citric	lb.	0	2	4	to	0	2	5
Formic, 80%	ton	65	0	0	to	67	10	0
Gallic, pure	lb.	0	3	10	to	0	4	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol	ton	40	0	0	to	43	0	0
Lactic, 60 vol	ton	43	0	0	to	45	0	0
Nitric, 80 Tw	ton	38	0	0	to	40	0	0
Oxalic	lb.	0	0	8	to	0	0	8½
Phosphoric, 1.5	ton	45	0	0	to	47	0	0
Pyrogallic, cryst	lb.	0	7	3	to	0	7	9
Salicylic, Technical	lb.	0	1	2	to	0	1	3
Salicylic, B.P	lb.	0	1	5	to	0	1	6
Sulphuric, 92-93%	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	3	0	to	0	3	6
Tartaric	lb.	0	1	4	to	0	1	5
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	37	10	0	to	40	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	12	0	0	to	13	0	0
Aluminium, sulphate, 17-18%	ton	15	0	0	to	16	0	0
Ammonia, anhydrous	lb.	0	1	10	to	0	2	0
Ammonia, .880	ton	35	0	0	to	37	0	0
Ammonia, .920	ton	22	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	45	0	0	to	47	10	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	90	0	0	to	95	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to		—	
Amyl acetate	ton	150	0	0	to	160	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, Chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	15	0	0	to	16	0	0
Nitrate	ton	40	0	0	to	42	0	0
Barium Sulphate, blanc fixe, dry	ton	26	0	0	to	28	0	0
Sulphate, blanc fixe, pulp	ton	16	0	0	to	16	10	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0

	Per	£	s.	d.		£	s.	d.
Bleaching powder, 35-37%	ton	14	0	0	to		—	
Borax crystals	ton	31	0	0	to	32	0	0
Calcium acetate, Brown	ton	8	0	0	to	9	0	0
,, ,, Grey	ton	10	0	0	to	11	0	0
Calcium Carbide	ton	22	0	0	to	23	0	0
Chloride	ton	8	10	0	to	9	0	0
Carbon bisulphide	ton	60	0	0	to	62	0	0
Casein, technical	ton	85	0	0	to	90	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb	0	11	0	to	0	11	6
Oxide, black	lb.	0	10	6	to	0	11	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	29	10	0	to	30	10	0
Cream Tartar, 98-100%	ton	125	0	0	to	130	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	85	0	0	to	90	0	0
Formusol (Rongalite)	lb.	0	3	9	to	0	4	0
Glauber salts, commercial	ton	5	5	0	to	5	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	30	0	0	to	35	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	42	10	0	to	45	0	0
Carbonate (White Lead)	ton	44	0	0	to	47	0	0
Nitrate	ton	48	10	0	to	50	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	26	0	0	to	28	0	0
Magnesium chloride	ton	12	0	0	to	13	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	9	10	0	to	10	0	0
Sulphate (Druggists')	ton	15	10	0	to	17	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	70	0	0	to	75	0	0
Methyl acetone	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone	ton	90	0	0	to	95	0	0
Nickel sulphate, single salt	ton	65	0	0	to	66	0	0
Nickel ammonium sulphate, double salt	ton	67	0	0	to	68	0	0
Potash, Caustic	ton	33	0	0	to	33	10	0
Potassium bichromate	lb.	0	0	7¾	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride 80%	ton	15	0	0	to	20	0	0
Chlorate	lb.	0	0	6	to	0	0	6½
Meta bisulphite, 50-52%	ton	112	0	0	to	120	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	0	11	to	0	1	0
Prussiate, red	lb.	0	2	4	to	0	2	6
Prussiate, yellow	lb.	0	1	2½	to	0	1	3
Sulphate, 90%	ton	20	0	0	to	22	0	0
Salammoniac, firsts	cwt.	3	5	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	26	0	0	to	27	0	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	6	to		—	
Bisulphite, 60-62%	ton	25	0	0	to	27	10	0
Chlorate	lb.	0	0	4½	to	0	0	4½
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	10	0	to	26	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	15	0	0	to	16	0	0
Nitrite, 96-98%	ton	37	10	0	to	40	0	0
Phosphate, crystal	ton	22	10	0	to	23	10	0
Perborate	lb.	0	1	4	to	0	1	6
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	15	0	0	to	17	0	0
Sulphide, solid, 60-62%	ton	24	10	0	to	25	10	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	80	0	0	to	85	10	0
Strontium Nitrate	ton	70	0	0	to	72	10	0
Strontium Sulphate, white	ton	7	10	0	to	8	10	0
Sulphur chloride	ton	41	0	0	to	42	0	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Tin perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride, 102 Tw	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	35	0	0	to	40	0	0
Oxide, 99%	ton	36	0	0	to	37	0	0
Dust, 90%	ton	47	10	0	to	50	0	0
Sulphate	ton	21	10	0	to	22	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	3
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	3	to	0	2	6
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	6	to	0	1	7
Anthracene, 40-50%	unit	0	0	5½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	9	to	0	4	3
Benzidine, base	lb.	0	5	6	to	0	6	0
Benzidine, sulphate	lb.	0	5	6	to	0	6	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzoate of soda	lb.	0	1	9	to	0	2	0
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	5	9	to	0	6	0
Betanaphthol	lb.	0	2	0	to	0	2	2
Betanaphthylamine, technical	lb.	0	7	0	to	0	7	3
Croceine Acid, 100% basis	lb.	0	3	9	to	0	4	0
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	0
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	4	to	0	1	5
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	3	9	to	0	4	0
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	7	6	to	0	8	0
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	6	to	0	7	0
Monosulphonic Acid (2.7)	lb.	0	7	0	to	0	7	6
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	9	to	0	5	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	3	to	0	1	4
Orthoamidophenol, base	lb.	0	15	0	to	0	18	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	11	0	to	0	11	6
Para-amidophenol, hydrochlor	lb.	0	11	6	to	0	12	0
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	6	to	0	4	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	3	9	to	0	4	0
Resorcin, technical	lb.	0	5	6	to	0	6	0
Resorcin, pure	lb.	0	7	6	to	0	7	9
Salol	lb.	0	2	4	to	0	2	6
Sulphanilic acid, crude	lb.	0	1	4	to	0	1	6
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

French Potash

SINCE the last report there has been a good deal of inquiry from large buyers of Kainit 14 per cent., as well as for Sylvinite 20 per cent., a grade which is offered at very attractive prices. In view of the competitive conditions which are tending to depress prices for all grades of potash below cost of production, merchants are more inclined to lay in stocks. The deficiencies occasioned by the war still leave much room for the increased use of potash, especially on the lighter soils under intensive cultivation. Reports from the Continent indicate that the demand for potash for agricultural uses, both in France and in Germany is much greater than before the war.

Recent Wills

Dr. Francis Arthur Bainbridge, formerly of Stocksfield-on-Tyne, Northumberland, late of Clarence Gate Gardens, Regent's Park, London, N.W., Professor of Physiology at the University of London, and well known as a gas poison expert £10,334

Mr. William Hole, of 3, Northumberland Road, Bristol, a director of Ayrton, Saunders & Co., Liverpool (net personalty £3,104) £4,299

Mr. Edward John Bevan, F.I.C., of Abington, Rickmansworth Road, Watford, Herts., and of New Court, Carey Street, London, W.C., County Analyst for Middlesex, and Past President of the Society of Public Analysts .. £2,764

Mr. Thomas Ryan, of Sherbrook Lodge, Buxton, Derbyshire, managing director of the Buxton Lime Firms, Ltd. £24,007

Company News

SHELL TRANSPORT AND TRADING CO., LTD.—An interim dividend of 2s. per share, free of tax, is payable on January 5 next to holders on the registers on December 5.

ENGLISH OILFIELDS, LTD.—The balance sheet at September 30 last shows that the balance from last year of the cost of development and administration expenses was £9,424, while during the period under review expenditure amounted to £33,821, increasing the debit to £43,246.

VULCANITE, LTD.—The net profit for the year to October 31 last, after adjustment of excess profits duty and providing for Corporation profits tax, was £7,016, plus £4,872 brought in, making £11,888. After paying a dividend of 7½ per cent., less tax, on the ordinary shares for the year, £7,555 remains to be carried forward.

SOUTH AMERICAN COPPER SYNDICATE.—The report contains the announcement that the capital of £50,000 in 2s. shares is to be increased by the creation of 250,000 shares of 2s. each to be offered to the shareholders at 5s. per share. This issue will bring the capital up to £75,000. The year ended June 30 resulted in a net loss of £14,163, which is explained by the small output, only 412 tons of 16.8 per cent. matte being produced.

EGYPTIAN SALT AND SODA CO., LTD.—A dividend of 22½ per cent. for the year ended August 31 last (less income-tax), will be paid to the ordinary shareholders whose names are on the register of the company on January 3 next. Interest coupon No. 23 on the company's bearer warrants for ordinary shares will be paid on and after January 3 at the National Bank of Egypt, 6 and 7, King William Street, London, E.C., and the same bank's branches in Cairo and Alexandria.

EXPLOSIVES AND CHEMICAL PRODUCTS, LTD.—Holders of share warrants wishing to attend the sixteenth annual ordinary general meeting, which will be held at Finsbury Pavement House, Finsbury Pavement, London, E.C. 2, on December 30, at 11.30 a.m., must deposit their warrants on or before December 28, either at the registered office of the company as above, or at the offices of the Société Anonyme d'Explosifs et de Produits Chimiques, 5, Rue du Général Foy, Paris.

BRUNNER, MOND, & CO., LTD.—The Stock Exchange Committee announce that dealings have been specially allowed under Rule 148A, in 3,442 ordinary shares of £1 each, fully paid, Nos. 9,605,512 to 9,608,953. These securities will rank *pari passu* with those in which special settling days have already been appointed as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

UNITED INDIGO & CHEMICAL CO., LTD.—A Stock Exchange announcement allows dealings, under Rule 148A in 405,000 ordinary shares of 3s. 4d. each, fully paid, Nos. 120,001 to 525,000; and 120,000 five per cent. participating cumulative preference shares of 12s. 6d. each, fully paid, Nos. 120,001 to 240,000. These securities will rank *pari passu* with those in which special settling days have already been appointed, as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

LEVER BROTHERS, LTD.—The Stock Exchange Committee has allowed dealings, under Rule 148a, in 371 7 per cent. preference shares of £1 each, fully paid, Nos. 23,565,923 to 23,566,293, and 425 8 per cent. "A" preference shares of £1 each, fully paid, Nos. 15,468,706 to 15,469,130. These securities will rank *pari passu* with those in which special settling days have already been appointed, as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted, as soon as they are identical and are officially quoted. Warrants for dividends to December 31 on the preference and preferred ordinary shares will be posted on that date. The directors have declared a dividend of 10 per cent. on the ordinary capital and dividend on the co-partnership certificates. It is proposed to place to reserve a sum equal to a further 10 per cent. on the ordinary capital.

LOW TEMPERATURE CARBONISATION, LTD.—The directors announce that in view of the important developments which have followed as a result of the successful and continuous operation of the plant at Barnsley since August last, which should favourably and materially effect a complete change in the general position of this company, the directors have deemed it advisable to ask the shareholders to consent to the adjournment of the annual general meeting until they are in a position to place before them the full details of these new arrangements. In the best interests of the company it will be appreciated that, at the present moment, it is inadvisable to make public these negotiations, but the directors state that in the last few days they have received four inquiries for low temperature plants in this country, and are now quoting for the work. The annual meeting was held at the Hotel Victoria, Northumberland Avenue, London, on Thursday.

Tariff Changes

MEXICO.—As from January 1 next the Customs import duties on medicinal drugs, pharmaceutical specialities and certain chemical products will be increased by 50 per cent. Aromatic waters, distilled, not containing alcohol, extracts of dyewoods and tanning woods; matches of all kinds, and medicinal and toilet soaps will similarly be subject to an increase of 100 per cent. Full particulars may be obtained from the Tariff Section of the Department of Overseas Trade.

SPAIN.—The rate of surcharge for December in respect of import and export duties, Customs fines, etc., paid in Spanish silver coins or notes of the Bank of Spain has been reduced to 40.95 per cent.

TUNIS.—Petroleum schist and other refined mineral illuminating oils, petroleum spirit, heavy oils, and residues, may now be exported without restriction. Until further notice home-grown oil seeds may freely be exported to any destination provided that consignments do not weigh more than 1,000 kilogs.

GERMANY.—It is proposed to double the Customs duties on soap and certain kinds of perfumery, gas mantles, and a number of medicinal and pharmaceutical goods.

CANADA.—A memorandum (No. 9 Revised Supplement A) contains rulings in connexion with the marking of goods imported into Canada on and after January 1 next. The rulings, which include acids and chemicals, china clay, coal tar, containers, dyestuffs, glassware, paints and oils, soaps, &c., may be inspected at the Tariff Section of the Department of Overseas Trade, 18, Queen Anne's Gate, London, S.W.1.

NEW ZEALAND.—A new Customs Tariff has been passed with a few alterations to the original draft. As from January 1, 1923, Customs preference will be accorded to cream of tartar and substitutes.

ECUADOR.—The collection of all or part of the taxes levied on rubber exported from Ecuador is suspended.

GERMANY.—An export free list which came into effect on December 15, and published in the Board of Trade *Journal* (December 15, p. 639), includes quebracho and other tanning woods, thickened sulphite lyes, vinegar, ozokerite, sulphur, &c.

SPAIN.—All restrictions on the export of olive oil are withdrawn.

Dr. Plimmer's New Appointment

DR. R. H. A. PLIMMER, who for the last two years has been head of the Bio-Chemical Department of the Rowett Institute of Animal Nutrition at Aberdeen, has been appointed to the chair of Medical Chemistry at St. Thomas's Hospital Medical School in the University of London. Educated at Dulwich, Dr. Plimmer graduated B.Sc. at University College, London, in 1899, and D.Sc. in 1902. He gained a wide reputation as an authority on protein chemistry, as a result of his researches at University College. He was elected a Fellow of that college in 1906, and in 1911 became honorary secretary of the Bio-Chemical Society.

Tenders Invited for Chemicals and Drugs

THE Department of Public Health, Cairo, invites tenders by January 20 next for the supply of proprietary articles, sundries (including bottles, demijohns, &c.), crude drugs and heavy chemicals, fine chemicals, and galenicals and packed articles. Representation by an agent resident in Egypt is essential. The Department of Overseas Trade can supply to United Kingdom firms not represented there the names of firms with branches in Egypt who may be prepared to handle tenders on behalf of third parties. A copy of the specification, conditions and tender form can be seen by firms interested at the Department of Overseas Trade (Room 84), 35, Old Queen Street, Westminster, S. 1. The reference number is 6837/FE/PN.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnership Dissolved

BILL, Clement Henry, and DERRINGTON, Albert Edward, under the styles of Adolphe Crosbie & Co. and Joseph Highfield & Co., paint manufacturers, by mutual consent December 17, 1921. Debts received and paid by C. H. Bill, who will continue the business.

Bankruptcy Information

FLEMING, Sidney (trading as Fleming & Co.), 9, Shortlands Road, Shortlands, Kent, and of 47, Mark Lane, London, chemical manufacturer. Receiving order, December 20. Creditor's petition. First meeting, January 6, 11 a.m., and public examination, March 8, 1922, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C. 2.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

ALLKINS, W. Hudson, 1, Exchange Buildings, Coulsdon, chemist. £11 8s. 6d. October 27.

BOWMAN'S DRUG STORES, Lowther Arcade, Carlisle, chemists. £10 5s. 4d. October 27.

DOVEY, G., 95-7, Victoria Street, Basford, Stoke-on-Trent, chemist. £23 17s. 8d. October 24.

Deed of Assignment

BROOME, James Arthur, trading as Davies & John, 15, Old Bond Street, Bath, chemist and druggist. Trustee, P. S. Booth, 14-17, Holborn Viaduct, London, E.C., accountant. Filed, December 22. Liabilities unsecured, £3319; assets, less secured claims, £3937.

Bill of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

CAMERON, William Arthur, 30, Eastbourne Road, Aintree, Liverpool, vitriol maker. December 21. £30.

HAGUE, WILLIAM ALEX, 33, Linburn Road, Woodseats, Sheffield, analytical chemist. December 14. £30.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

BRIDGE (G. E.) & CO., LTD., Bournemouth, chemists. Registered December 12, debentures dated November 25, 1921, securing £1,350 and further advances not exceeding in all a total of £3000 to G. E. W. Bridge, Dytchleys, Woking, engineer, and others; general charge. *£1,350. December 10, 1921.

LACTINE, LTD., Yiewsley, chemical manufacturers. Registered December 13, £3,000 debentures; charged on land and buildings at Yiewsley, also general charge. *Nil. December 29, 1920.

Satisfaction

JOHNSON (CAIRNS), LTD., Birmingham, chemists. Satisfaction registered December 13, £200, registered October 21, 1918.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

CARTER'S HIGH-GRADE FERTILISERS, LTD., 50, Mark Lane, E.C. 3, general merchants, tar distillation and tar products, manufacturers and dealers in minerals, manures, fertilisers, &c. Nominal capital: £5,000 in 5,000 ordinary shares of £1 each.

THOMAS EVANS & SON (PENDLETON), LTD. Chemists and druggists. Nominal capital, £1,500 in 1,500 shares of £1 each. Directors: H. N. Evans, 7, Whit Lane, Pendleton; J. Jones, 98, Claremont Road, Pendleton.

LATHAMS (BRIERCLIFFE), LTD., 142, Burnley Road, Briercliffe, near Burnley. Chemists, druggists, chemical manufacturers, drysalters, &c. Nominal capital, £500 in 500 shares of £1 each.

LORIVAL MANUFACTURING CO., LTD., manufacturers of chemicals of every description, electrical appliances and accessories. Nominal capital: £10,000 in 10,000 shares of £1 each. A director: H. J. T. Mitchell, 52, Bishopsgate, E.C. 2.

METALS PRODUCTION, LTD., 62, London Wall, E.C. 2. Metallurgical chemists, refiners, &c. Nominal capital, £50,000 in 50,000 shares of £1 each.

MICHAEL HEATHCOTE, LTD. To carry on the business of chemical manufacturers and merchants, bone crushers, &c. Nominal capital: £2,700 in 2,700 shares of £1 each. A subscriber: A. Heathcote, Forest Street, Sutton-in-Ashfield, Notts.

H. MOTSON & CO., LTD., 25, Pownall Crescent, Colchester. Chemists and druggists. Nominal capital, £100 in 100 ordinary shares of £1 each. Directors: H. Motson, 25, Pownall Crescent, Colchester; J. R. Morris, 25, Pownall Crescent, Colchester.

NAPIERS PHARMACY, LTD., 45, New Road, Portsmouth, Hants. Chemists, druggists, &c. Nominal capital, £500 in 500 shares of £1 each.

ORGANIC FERTILIZERS, LTD. (Public Company), 20, Copthall Avenue, E.C. 2. To acquire the benefit of certain inventions in relation to the treatment of sewage and other waste products and to turn same to account. Nominal capital, £200,000 in 100,000 preference shares and 100,000 ordinary shares.

OVERSEAS OIL SYNDICATE, LTD., 10-12, Copthall Avenue, E.C. 2. To purchase lands containing or deemed to contain oil or similar products, metals or other minerals, and turn same to account. Nominal capital, £25,500 in 25,000 ordinary shares of £1 each and 10,000.

REFINERIES & CO., LTD. Chemists and druggists, refiners, metallurgists, &c. Nominal capital, £10,000 in 9,000 ordinary shares and 1,000 15 per cent. preference shares of £1 each. Directors to be appointed by subscribers. A subscriber: M. Rodgers, 7, Henrietta Street, London, W.C.

RUBBERINE, LTD. To acquire information as to any invention in relation to the solidifying and toughening of oils and to the manufacture and use of artificial rubber or substitutes for rubber. Nominal capital: £4,500 in 60,000 shares of 1s. 6d. each; minimum subscription, seven shares. A director: W. C. Bersey, 56, Moorgate Street, E.C. 2.

SAFE SUPERHEAT, LTD. Manufacturers and dealers in the necessary apparatus, appliances and machinery for the high temperature inventions and processes, and the business of general engineers. Nominal capital, £15,000 in 15,000 shares of £1 each. A. F. Maclaren, 244, High Holborn, W.C. 1 (Managing director).

STAR CHEMICAL CO., LTD., 364a, Mare Street, Hackney. Chemists and druggists. Nominal capital, £100 in 100 ordinary shares of £1 each. A director: C. E. Thomas, 125, Upper Clapton Road, London, E.

HENRY LEVIN WEBB & CO., LTD., 9, Sugar House Lane, Stratford, E. 15, Metal merchants and chemical manufacturers. Nominal capital: £5,000 in 5,000 shares of £1 each.

WHITE HANDS SOAP CO., LTD. Soap manufacturers and boilers. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: J. T. Clark, 15, St. Albans Road, Darwen; C. T. Barker, Moorthorpe Cottage, Darwen.

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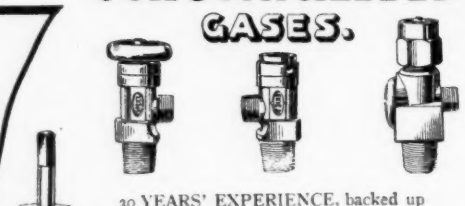

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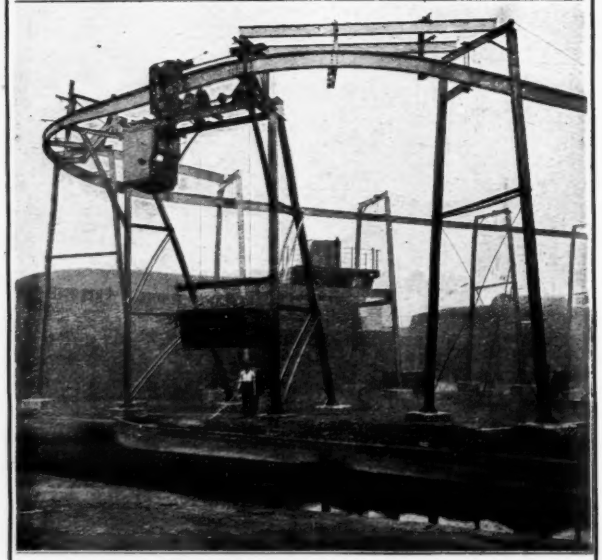

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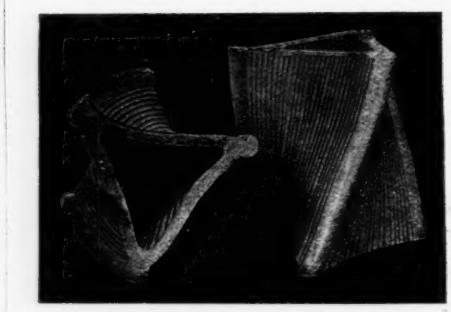

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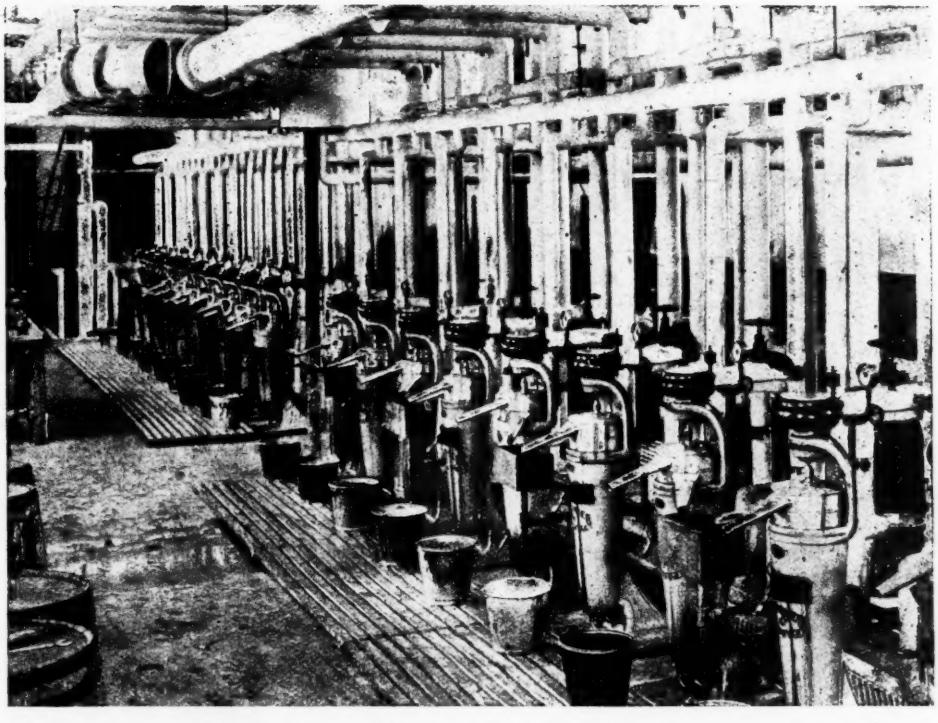

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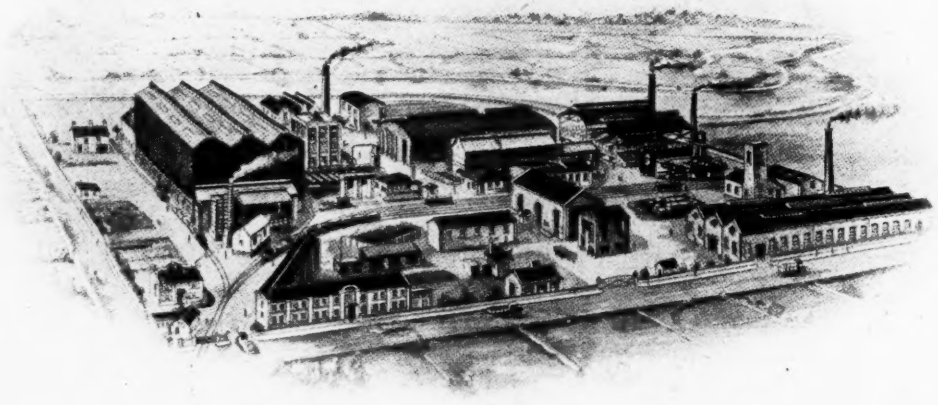

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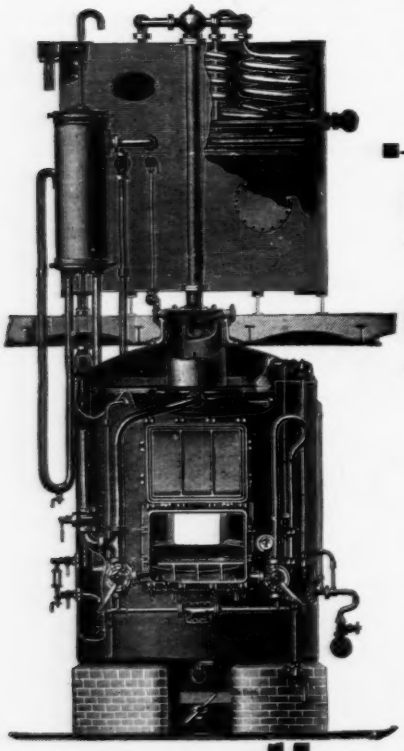

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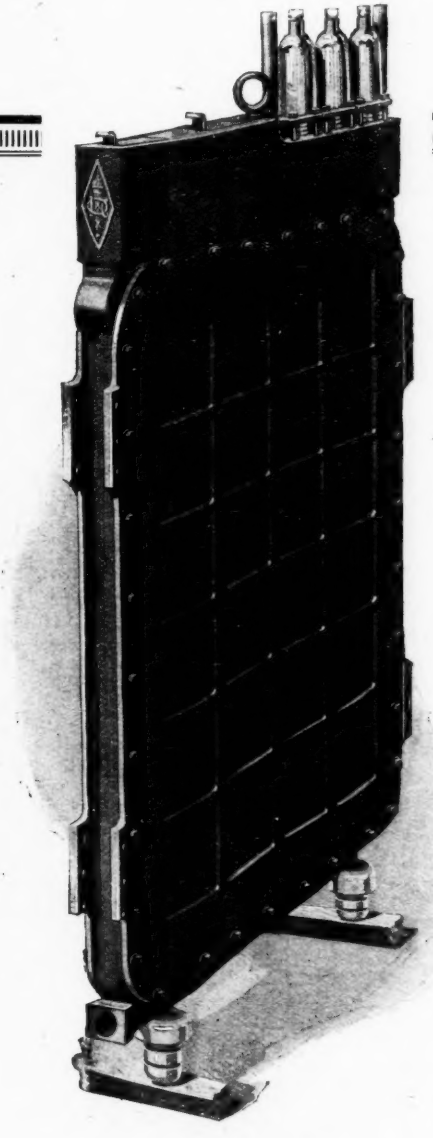

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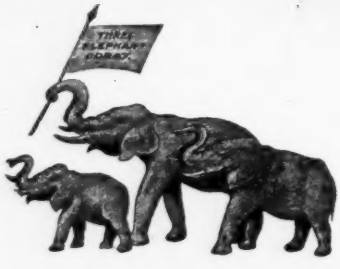

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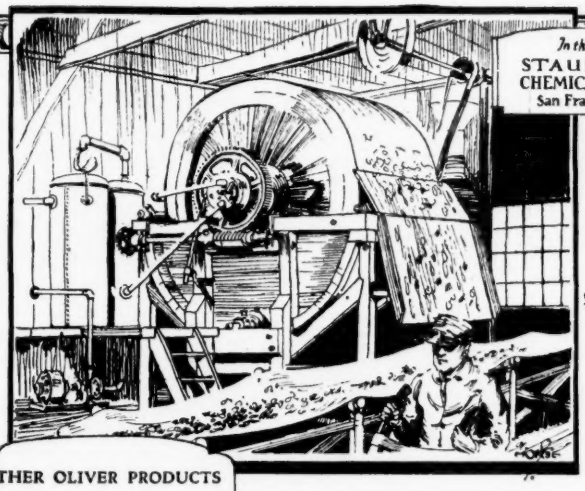

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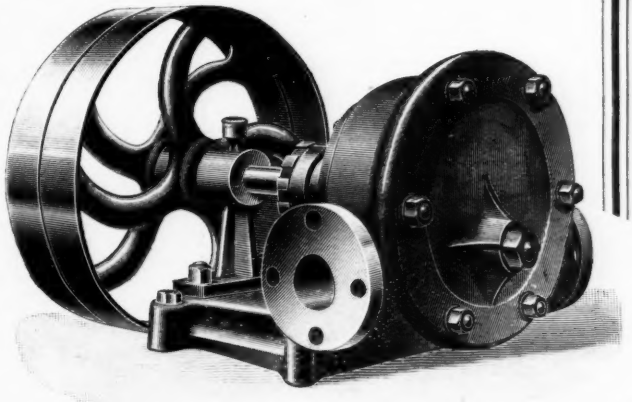

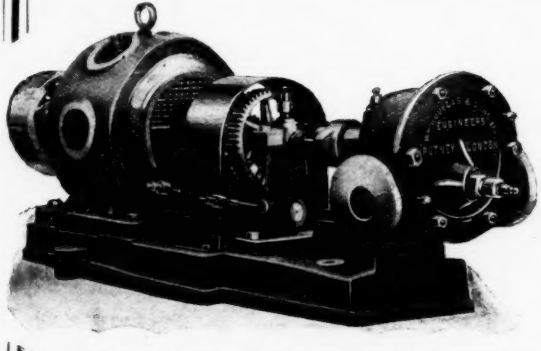

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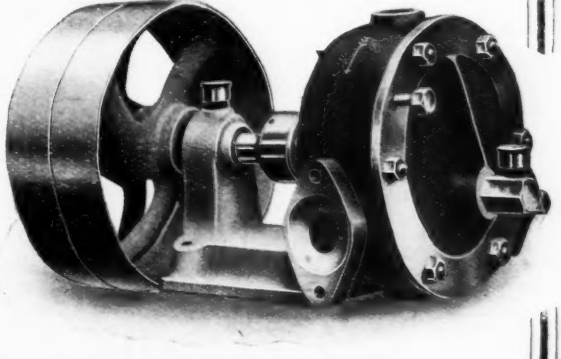

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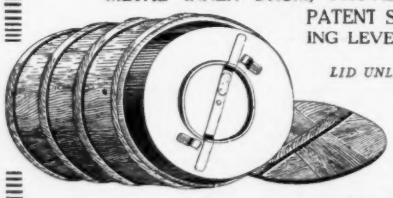

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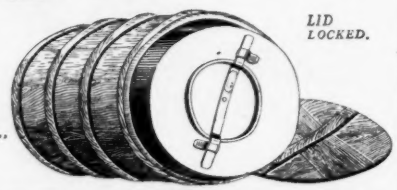

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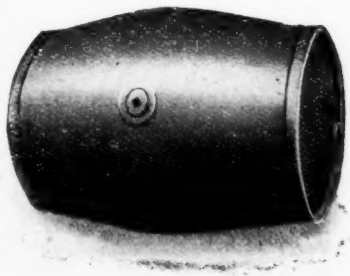

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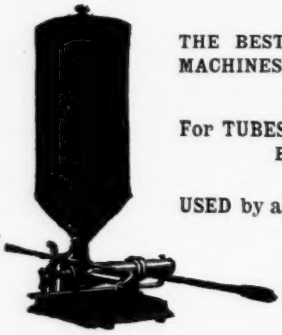

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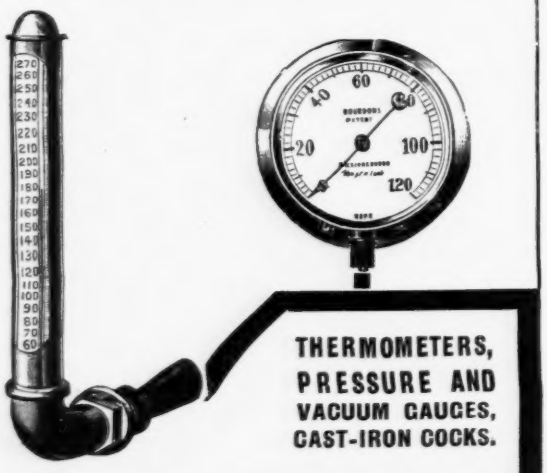

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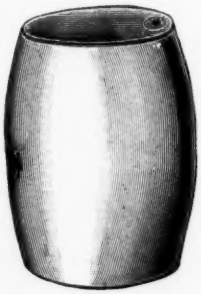

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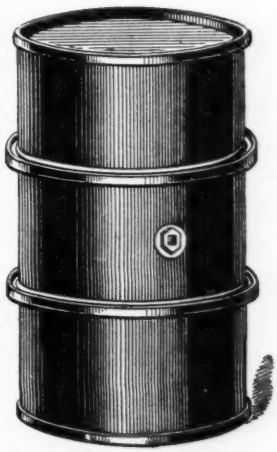

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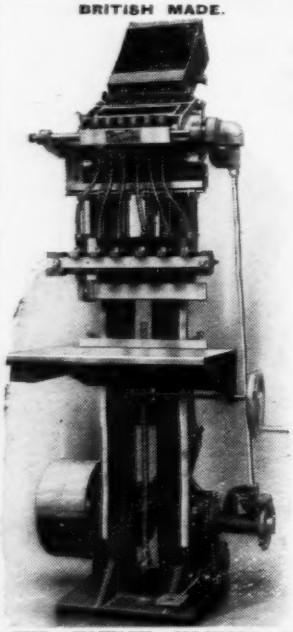

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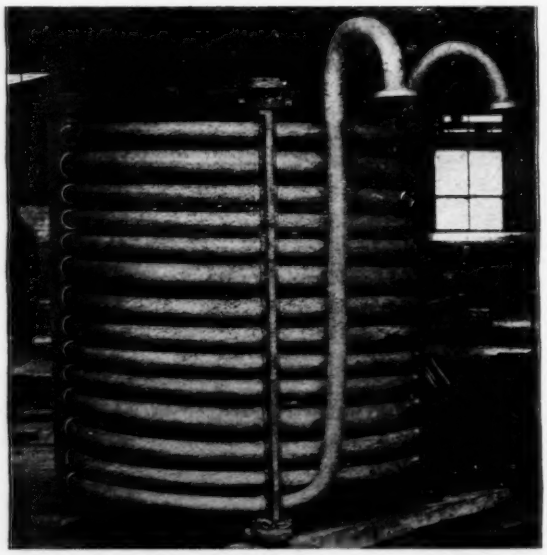

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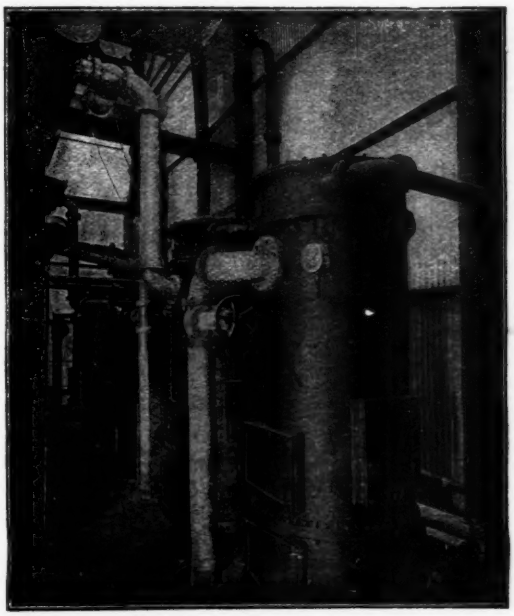

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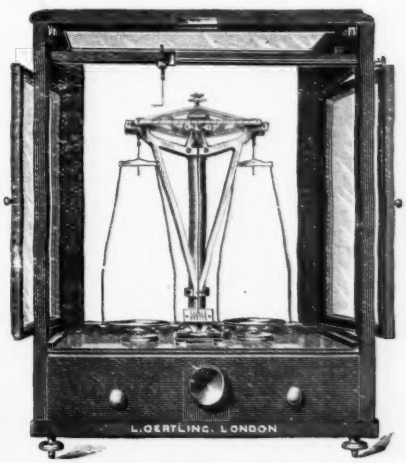

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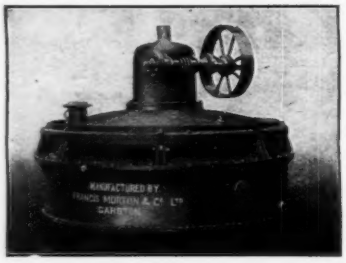

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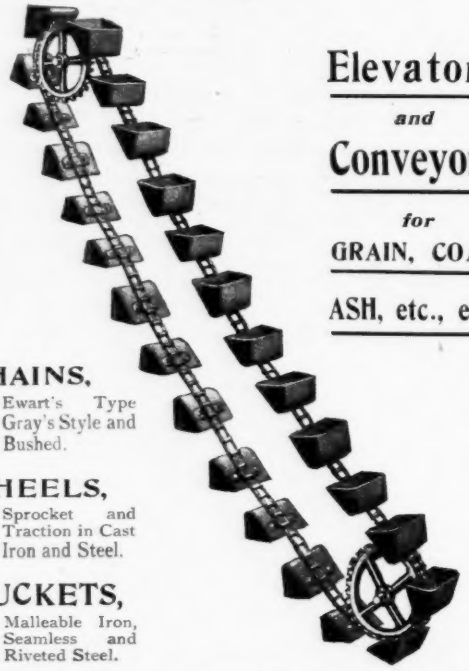

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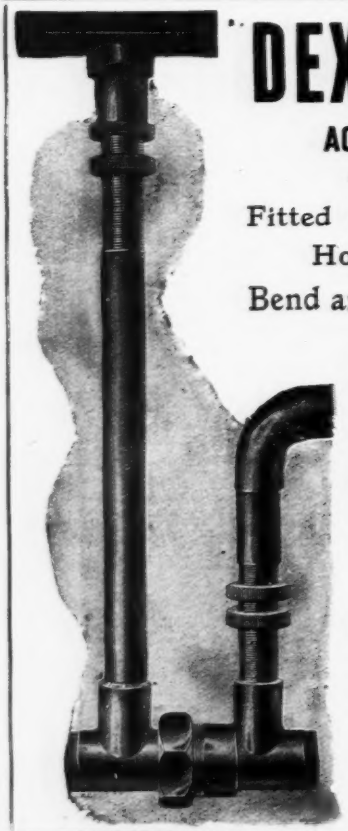

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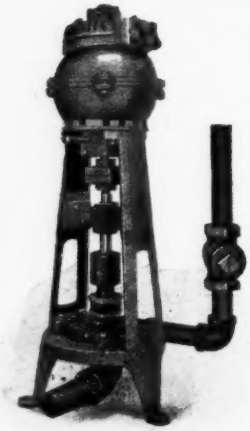

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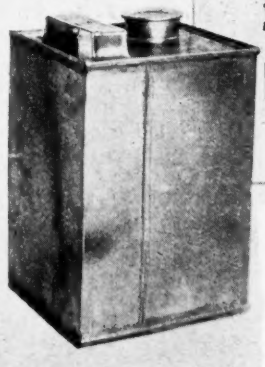

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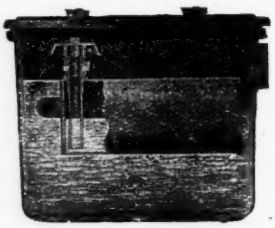

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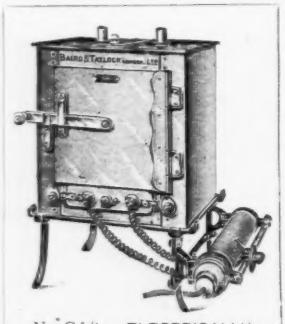

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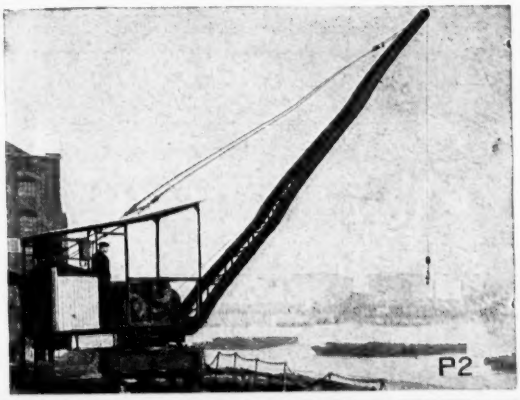

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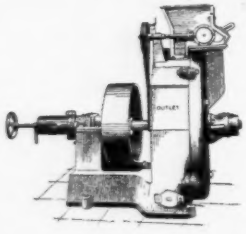

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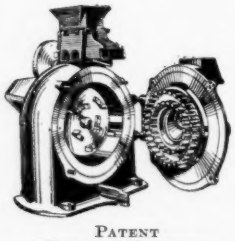

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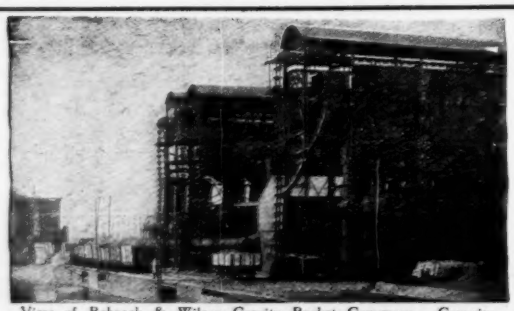

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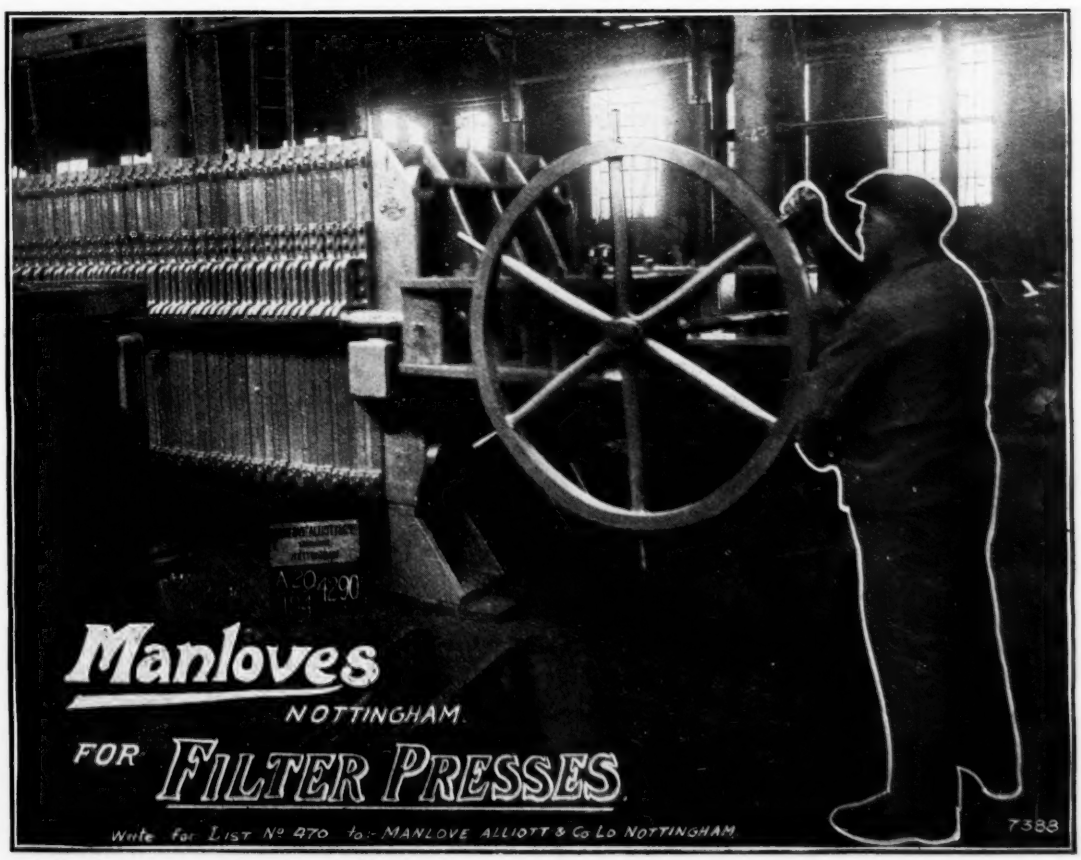

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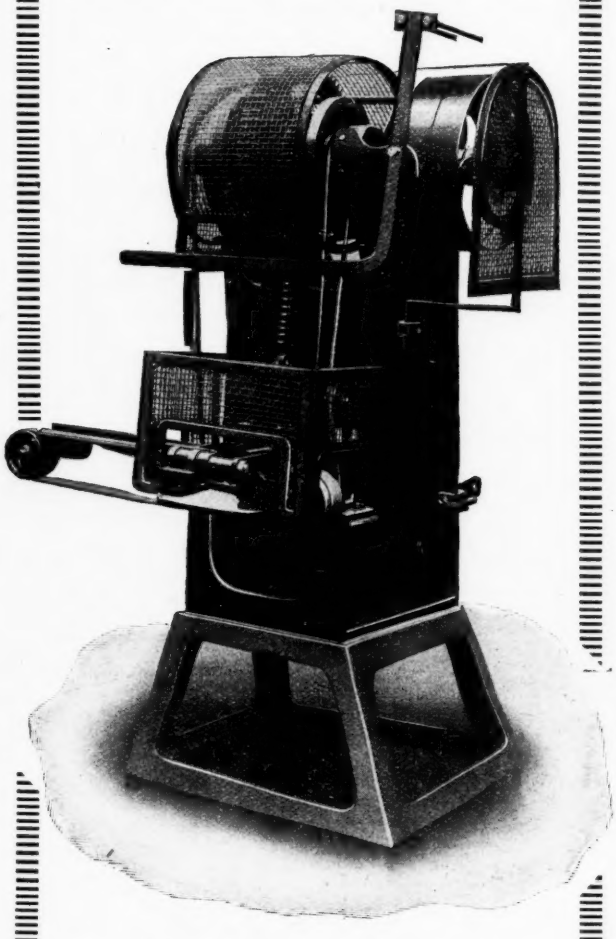

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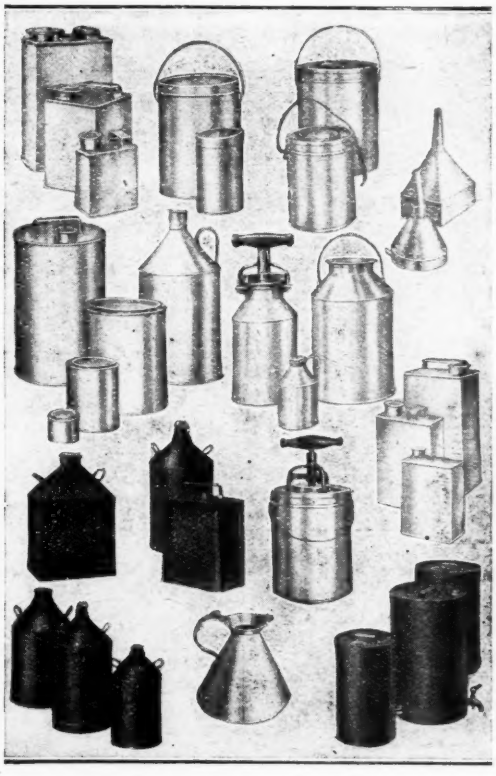

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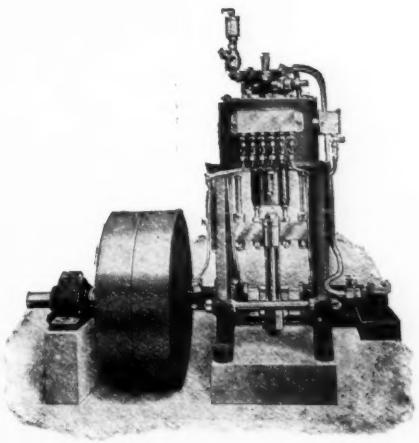

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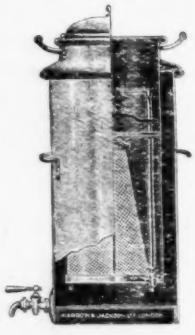

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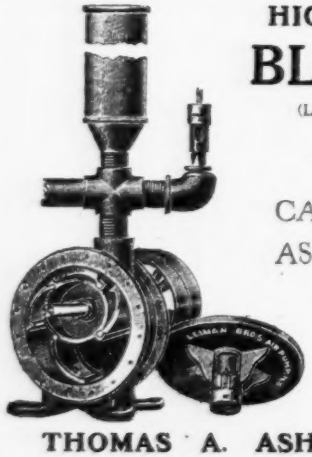

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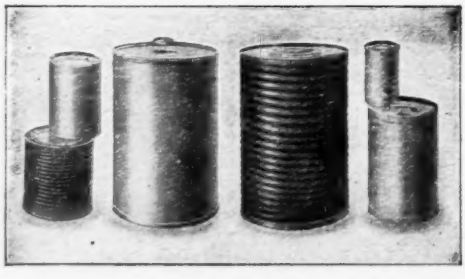

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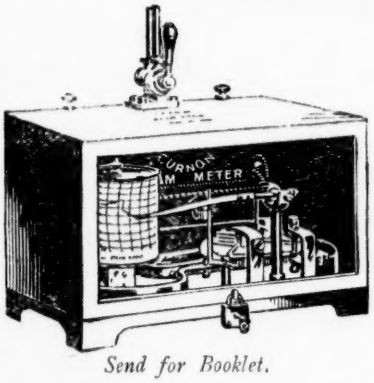

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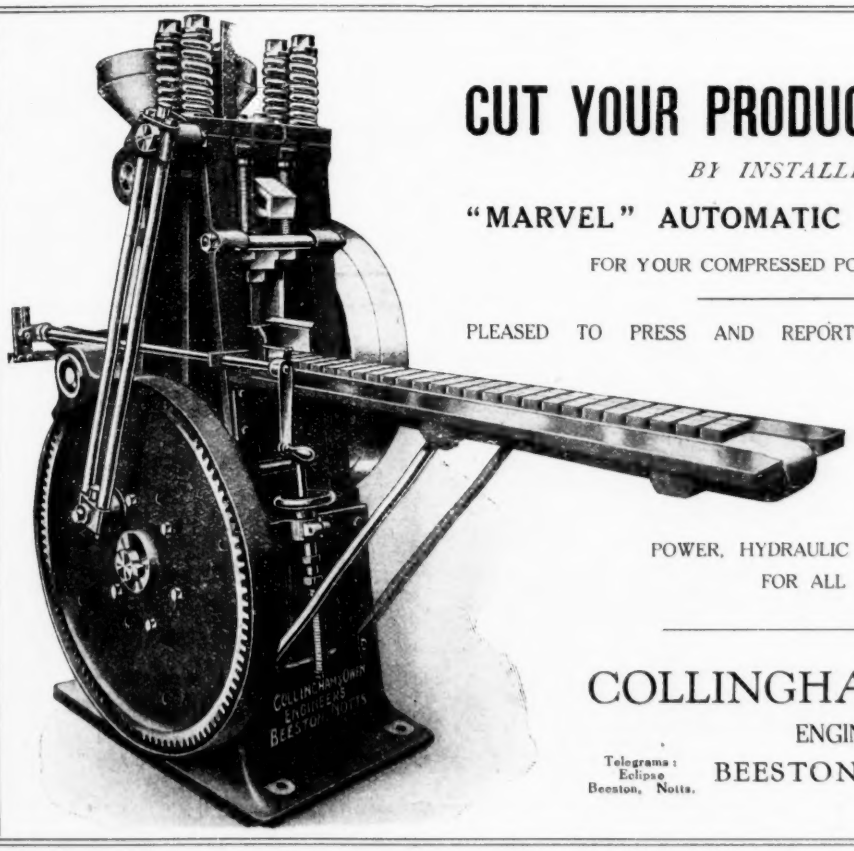

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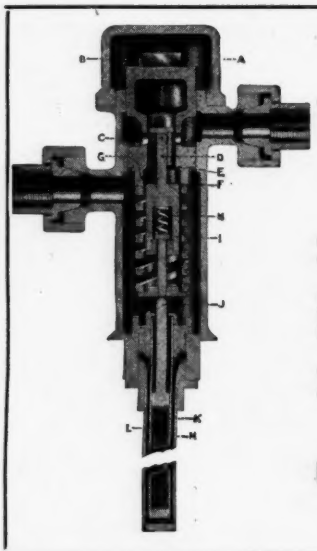

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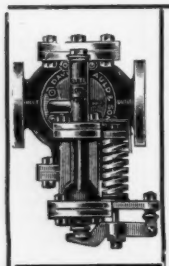

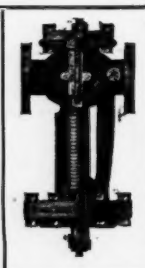

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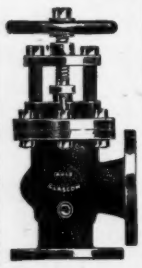

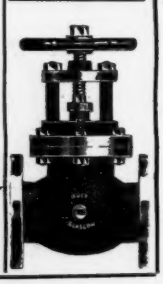

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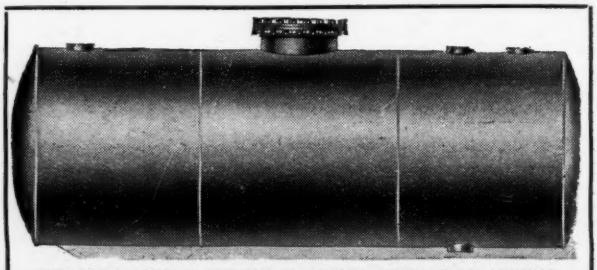

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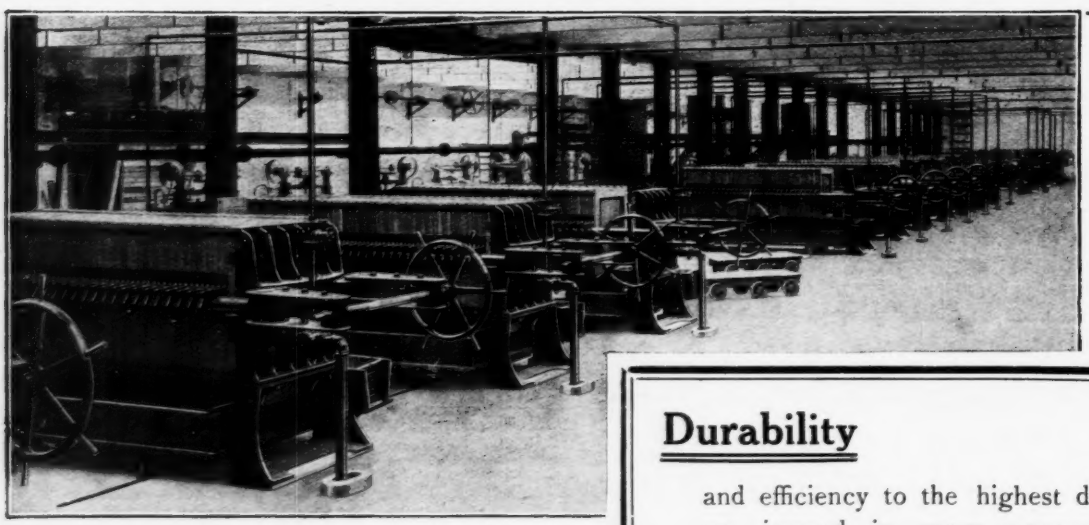

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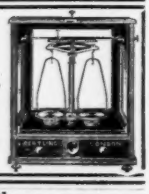

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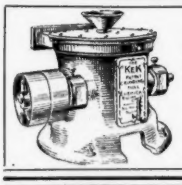

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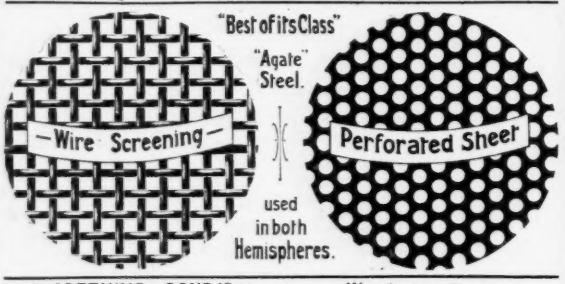

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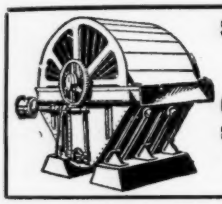

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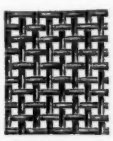

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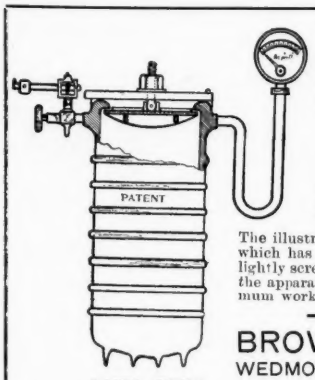

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